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# T R E A T I S E

O N

## WATERING MEADOWS.

WHEREIN

ARE SHEWN SOME OF THE MANY ADVANTAGES ARISING FROM THAT

M O D E o f P R A C T I C E,

PARTICULARLY ON

COARSE, BOGGY, or BARREN LANDS.

With Four COPPER PLATES.

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Flooding is truly the best of all Improvements, where it can be effected; and there ought not to be a single Acre of Land neglected, which is capable of it. KENT's Hints to the Landed Interest.

Affiduity, Experience and Common Sense form a far surer Guide to us, than Fancy and Theory.

ANONYMOUS.

---

L O N D O N:

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M DCC LXXIX.

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T O  
H E N R Y T H O M A S,  
E A R L O F I L C H E S T E R,  
L O R D I L C H E S T E R A N D S T A V O R D A L E,

A N D  
B A R O N o f R E D L Y N C H , i n t h e C o u n t y o f S o -  
M E R S E T , B A R O N S T R A N G W A Y S , o f W O O D S -  
F O R D S T R A N G W A Y S , i n t h e C o u n t y o f D O R S E T .

A N D T O  
J A M E S F R A M P T O N ,  
o f  
M O R E T O N , i n t h e s a m e C O U N T Y , Esq;

T H I S  
T R E A T I S E .  
o n  
W a t e r i n g o f M e a d o w s , L o w L a n d s , &c.

I S ,  
W i t h t h e u t m o s t D E F E R E N C E a n d R E S P E C T ,

I N S C R I B E D

B y T H E I R M O S T O B E D I E N T ,  
A n d O B L I G E D H U M B L E S E R V A N T ,

Piddletown, Dorset,  
March 25, 1779.

GEORGE BOSWELL.

T O T H E  
R E A D E R.

THE Author of the following Treatise, having often heard a gentleman (to whom he has great obligations) express a wish, that some of the many modern writers on husbandry had employed their thoughts on the subject of Watering Meadows ; a subject, which to him appeared of great importance, tho' but little understood, and where practised, but ill executed,--- was induced to commit to writing his humble sentiments, on this mode of improvement ; which having been favorably received by his Benefactor, and also by some few others, who have perused them, he has been encouraged to offer them, such as they are, to the Public. And to the candor of that Public, he trusts, for the pardon of such omissions and errors, as will too probably be found in the genuine work of a practical Farmer.

C O N-

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T R E A T I S E  
O N  
WATERING MEADOWS.

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I N T R O D U C T I O N.

EVERY gentleman, who has travelled through the different counties in the kingdom, with a view to their improvement, must have observed the very great quantities of unimproved, boggy, rushy, wet land, that lie, almost every where, near the banks of rivers, and lesser streams, that seem to have baffled the skill of their predecessors ; for whilst large tracts of heath, and barren uplands have, at an immense expence, been, in various parts of the kingdom, cultivated ; scarce any thing has been done towards improving the boggy, low lands, which at present are a reproach to the age, a disgrace to the country, and a nuisance to the occupiers. An attempt in the following sheets is made to convince the gentleman, and husband man, that the money laid out in improving such lands, and converting them into what are called Water Meadows, is by no means equal to, what is necessary for improving the barren

B uplands :

uplands : that the improvement is infinitely superior ; and also to convince both that it is practicable. To engage their attention, they are now assured, that the following pages, are not the effusion of a garreteer's brain, nor a Bookseller's job, but the result of several years experience ; and now committed to the press with not a little labour, at the request of some friends, as remarkable for their assiduous attention to the good of the community, as for their knowledge of the subject. The plans are actually drawn from meadows now watered ; and an attempt is made to form, and digest the whole into a regular system, plain and intelligible, for the use and assistance of such gentlemen, and farmers, who may have lands, so situated, as to be capable of improvement by watering.

It must appear strange, that not one of the writers on husbandry, has given a proper attention to the present subject (unless Blythe, in his Improver improved may be allowed to have done it) in a manner suitable to the importance of it ; considering what an amazing quantity of such lands are to be found in almost every county : some accounts indeed, are to be met with in Mr. Young's Tours ; but all the information that can be gotten from them is, that in such, and such places, there are very good Water Meadows, and that they are made

made valuable by leading the water over them.

The very intelligent author (Blythe) abovementioned, has indeed written expressly upon this subject, as well as upon almost every other branch of husbandry, with uncommon spirit, and zeal for the cause; and his works, if not perhaps the very best in our language, in the writer of this Essay's opinion, deserve to be much better known; from them he acknowledges to have received much general information; but the modern method of executing the work being very different from his, the original design of revising his writings upon the subject of Watering Meadows, and adding remarks and explanations, &c. was found necessary to be dropt.

As it is proposed in the following pages, to treat of the principles, upon which this system is founded, and to elucidate them; an explanation of the terms, and the instruments made use of, will be necessary. The lands properly adapted for watering; the method of laying them out; the manner how, and the time when, they should be watered, will be shewn. And to make the whole clear, and intelligible, different plans of the various works, with explanations of every part, will be added.

## C H A P. I.

## LANDS capable of being watered.

*Best Situation — Rivers, when capable of being made useful — Soils various Sorts described — Rivulets, or small Streams, great Advantages to be made of them — Coarse Meadow Land when properly watered of great Use to a Farm — A particular Instance pointed out — Springs when, and how far they may be made beneficial to the Farmer, by Watering Lands — a particular Example of the Fecundity of a clear Spring upon Meadow Land — Many Advantages attending Water Meadows pointed out.*

**A**LL lands, which lie low and near the banks of rivulets, brooks and springs, are capable of being watered, wherever the water is already higher than the lands, and kept within its course by the banks. If the rivulet, &c. have a very quick descent, the improvement by watering will be very great, and the expences small, for the greater the descent, the quicker the improvement. In all level lands the water runs slowly, which in general is the case also in large rivers, therefore but little land can be flooded by them, in comparison of what may be by smaller streams. But whenever large rivers run rapidly, are capable of being controuled,

trouled, and can be brought over the adjacent lands, the advantage is far greater than can be obtained from rivulets.

The water in large rivers is generally the most fruitful, for more land floods falling into them, they are fatter, and consequently more enriching to the meadows; but in many parts of the kingdom, where the great rivers are navigable, or have mills erected upon them, these are capital objections to the perfect improvement of the contiguous lands. By small rivulets and springs usually the most land may be watered, and certainly with the least expence.

The various sorts of soils to be found near the banks of rivers, brooks, &c. may all be reduced under the three following heads; nicer distinctions, for Water Meadows, are of no use to the practical improver. First, a gravelly, or sound, warm, firm, sandy soil, or, which often happens, a mixture of such, or indeed almost any soil that partakes of such qualities.

These soils, when there happens to be a descent from the river, make an almost instantaneous improvement, the faster the water runs over these soils the better.

“ Should, says *Blythe*, there happen to be  
“ a quantity of land that comes under this  
“ description, not one moment’s hesitation  
“ should be made about the success, for  
“ the advantage is the greatest that can be  
“ obtained

" obtained by any mode of husbandry, " with the least expence, and the greatest " degree of certainty." Second, Boggy, miry, and rushy soils (which always are found by the banks of rivers, where the land lies pretty level) are certainly to be greatly improved ; perhaps equally so with the other already described, when the value of each in their unimproved state is considered ; for this sort of land, is scarcely worth any thing in that state ; but by being properly watered, may be made to produce a large quantity of hay, that will winter, and greatly forward horned cattle ; altho' in its uncultivated form, it would not maintain any kind of stock all the winter, and but very little in the summer months. It must be observed, that to bring this sort of land into a proper state, much more expence and judgment is necessary, than in the former.

Third, Strong, wet, cold, clay soils are the most difficult to be improved, as well from their situation, which is mostly a dead level, as from their tenacity, which will not admit of draining, but with great expence, much care and attention, and even then, unless a strong body of water can be procured to throw over them, and that from a river, whose water is fruitful, little advantage will be reaped ; but whenever those advantages can be had in the winter, and

a warm

a warm spring succeeds, the crops of grass upon these lands are immense.

Rivulets and brooks are the streams that can be used to the greatest advantage, because the expence of erecting wares across them, will not be great, neither are there any of those objections to which large rivers are liable ; besides, if they run through a cultivated country, the land floods, occasioned by violent rains, bring a very large quantity of manure, such as chalk water, sheeps dung, and the straining of the arable fields, as well as the scourings of the roads, and ditches, the runnings of the farm yards, the drains, and sinks from the towns, and villages ; all of which are otherwise carried, by the rains, into the lesser, and from thence into the large streams, and are totally lost to the farmer. But, that is not all, and it may not be thought labor lost, to point out some more of the advantages, which attend the watering coarse meadow lands ; which neither the gentleman, nor farmer in those counties, where Water Meadows are unknown, can possibly form any idea of.

It is presumed that it will be readily admitted, that the larger the quantity of stock kept upon a farm, the greater will be the quantity of manure raised ; and that the greater the quantity of manure, the more land can be manured, or which is the same thing,

thing, the higher the arable lands may be manured; consequently, a larger burden of straw will be produced; this, the succeeding year will still increase the manure; and that will increase the quality of the arable lands, &c. &c. To apply this; a farm consisting of arable, and a certain quantity of coarse, boggy, unimproved land, commonly manures twenty acres of the arable annually. Now, by means of watering that coarse land, which, it is to be considered, after it becomes Water Meadow, is increasing in its quality by the draining of the farm-yards, roads, ditches, and the washings, by every heavy rain, of the cultivated country above it, that before always ran away into the rivulets, and were wasted; That meadow is made to produce from one to two loads of hay per acre. On an average, supposing there were twenty acres of such meadow; thirty loads per annum. The stock this quantity of hay will winter, and the dung it will produce, every farmer can calculate, and let him at the same time recollect, that the hay thus consumed, and the manure from it carried upon the arable land, is all an additional increase to the crop of corn, turnips, &c. consequently, the extra quantity of straw at harvest, must be placed to the same account; and this also, it is to be remembered, is every year in an increasing proportion. The value of  
the

the coarse land thus improved, does not rest here; for that increased quantity of manure upon the arable lands, in proportion as it enriches them, reverts again to the meadows; by the floods, violent rains, &c. still increasing the value of the Water Meadows more and more.

Springs may be made useful to the coarse lands that lie near them, if the water can be procured in quantity sufficient to float the lands. By springs, are not here meant those, which rise out of poor heath or boggy lands (for the water issuing from them, is generally so small in quantity, and always so very lean, and hungry in quality, that little advantage, if any, can be reaped from it) but rather the head of rivulets and brooks rising out of a chalky, or gravelly, sound, firm soil in a cultivated part of the country. These are invaluable, and every possible advantage should be taken, to improve the land near them. The Editor of these sheets knows a considerable tract of meadow land under this predicament; and one meadow in particular, that is watered by springs issuing immediately out of such a soil, without any advantage from great towns, &c. Being situated but a small distance below the head of the rivulet, no considerable places are above it, and the rivulet itself is fed all the way by springs rising out

of its bed as clear as chrystral. The soil of the meadow is a good loam, some inches deep upon a fine springy gravel. Whether it is from the heat of the springs, or whether the friction of the water running over the soil, does not raise a certain degree of warmth favourable to vegetation ; or from whatever cause it arises, the fecundity of this water is beyond conception ; for when the meadow is properly watered, and well drained, in a warm spring, the grass has been frequently cut for hay, within five weeks, from the time the stock was taken out of it, having eat it bare to the earth ; almost every year it is cut in six weeks, and the produce from one to three waggon loads on an acre. In land thus situated, in the mornings and evenings in the months of April, May, and June, the whole meadow will appear like a large furnace, so considerable is the steam, or vapor, which arises from the warmth of the springs acted upon by the sun beams ; and although the water is so exceeding clear, yet upon its being thrown over the land, only a few days in warm weather, by dribbling through the grass so very large, and thick a scum will arise, and adhere to the blades of the grass, as will be equal, to a considerable quantity of manure spread over the land ; and (it may be presumed

sumed from the effects) still more enriching.

One of the advantages of having Water Meadows has been pointed out, viz. by encreasing the quantity of winter food, and consequently, the quantity of manure for the uses of the farm, another and still greater may be added. The danger of a dry summer is particularly guarded against, where the lands are so situated, that they can be watered at any season.

It is inconceivable, what twenty-four hours water properly conveyed over the lands will do, in such season; a beautiful verdure will arise in a few days, where a parched, rusty soil could only be seen; and one acre will then be found to maintain more stock than ten would before. The peculiar benefit of such feed at such time, let those farmers estimate, who have experienced a dry summer with a large stock, and no meadows. A third advantage must not be passed over, as it may possibly stimulate some farmers to attempt to water their coarse lands. Every person who has a breeding stock of ewes knows the difficulty of procuring proper food for the lambs in February, March and April, after the turnips are eaten, or when they have failed, and before the natural or artificial grasses are fit to take them. This difficulty is effectually remedied by the Water Mea-

dows, which, when laid up in time, properly watered, and drained, will have a sufficient bite for the ewes and lambs by the end of February, and they may be kept in them with perfect safety, till the end of April ; nothing makes the ewe thrive better, than this spring grass, or produces more milk ; this is called spring feeding the meadows. To these advantages another may be addressed to the gentleman, who wishes to improve his estate ; and whose benevolent heart prompts him to extend a charitable hand to the relief of the industrious poor, and not to the encouragement of idleness, and vice ; almost the whole of the expences in this mode of cultivation is the actual manual labour of a class of people, who have no genius to employ their bodily strength otherways, for their's and their families support, consequently viewed in this light, the expences can be comparatively but small, the improvement great and durable.

## C H A P. II.

*An Explanation of the Principles, Terms, and Instruments used in WATERING MEADOWS. Apology for the Attempt—Principles elucidated.—Instruments and Tools described—Technical Terms, Reasons for using them—explained.*

THE Editor of this work here requests the indulgence of the candid reader, whilst he “attempts” to explain the principles upon which he has ventured to form the following system. Though ignorant of Mechanics, or Philosophy, as sciences, yet he knows, principles drawn from either, if just, are capable of demonstration, and that without some regular method, it would be very difficult to convey his ideas intelligibly, if he has succeeded, the end he wished to obtain is answered.

## P R I N C I P L E.

FIRST, Water conveyed out of any stream, river, &c. into a receptacle, will continue to run into it (supposing the sides of the receptacle raised high enough) till the water in it, is level with the water in the stream at the place from whence it was taken.

SECOND,

**SECOND,** In all rivers, streams, &c. there is a descent, more or less, in what degree, the motion of the current will shew; for if it run rapid, and cockle as it flows, the descent is considerable; but if slow and smooth, there is but little.

Hence follows the

**THIRD,** That if a main be taken out of a river far enough up the stream, water, from that river, may be brought to flow over the land, by the side of the river, a certain distance below the head of the main; although the river from whence it was taken, should, opposite that very place, be greatly under it.

**FOURTH,** Water sunk down under a carriage (which conveys another stream at right angles over it) one, two, or more feet below its own bed, will, when it has passed the carriage, rise again to the level it had before, exactly the same, as if there had been no carriage over it, see Prin. First.

**FIFTH,** Water conveyed upon any land, and there left any length of time does it an injury; for wherever water stagnates, it destroys the good herbage, if any; fills the land with rushes, flags, and various other weeds, and poaches it. From hence arises a

**SIXTH,** It is absolutely necessary to be quite certain, that the water can be thoroughly drained off, when it comes to be

con-

conveyed over the land, before the work is undertaken, lest both the labour, and expence, should be thrown away.

## INSTRUMENTS and TOOLS.

### *A Water Level.*

It's use is to take the level of the land at a distance compared with the part of the river, &c. from whence it is intended to take the water, to know whether it can, or cannot, be made to float the part intended to be watered. It is needless to give a description the mathematical instrument makers make it. In large undertakings it is very useful ; but as it seldom happens, that individuals undertake to water large quantities of land at a time, the workmen dispense with the use of it, bringing the water after them to work by. In drawing a main they begin at the head, and work deep enough to have the water follow them. In drawing a tail drain they begin at the lower end of it, and work upwards to let the tail water come after them. This method obtains the exactest level.

Line reel and breast plough are absolutely necessary. Every gardener, &c. knowing the use of the two former, they need not be described, excepting, that as the line is mostly

mostly used in the wet, it should be larger, and stronger, than those used in gardens. And as burnbeating (or denshiring, as it is often called) is now become almost general, a description of a breast plow, the instrument for performing that work will be easily dispensed with; especially as they are to be bought in London, and many other capital towns.

### S P A D E S.

Those used in working in the Water Meadows are made peculiarly for that purpose. The stems are considerably more crooked, than of any other sort; the bit is iron, about a foot wide in the middle, terminating in a point, a thick ridge runs perpendicularly down the middle, from the stem almost to the point, the edges on both are drawn very thin, and as they are obliged to be kept very sharp, they are often ground, and whetted. This necessarily wears them away, and they soon become narrow; they are then used for the narrow trenches, and drains, whilst new ones are used for the wider. The stems being made thus crooked, the workmen standing in a working position in the bottom of the trench, or drain, are enabled to make them quite smooth and even.

### W H E E L.

### WHEELBARROWS,

Are necessary to remove the clods to the flat places, they are made open without sides, or hinder part.

### HANDBARROWS,

Are used where the ground is too soft to admit of the wheelbarrows, when clods want to be removed during the time the meadow is in water.

### THREE WHEEL CARTS, &c.

When large quantities of earth want to be removed these will be found necessary, particularly when it is carried some distance.

SCYTHES, short and narrow, are used to mow the weeds and grass, when the water is running in the trenches, drains, mains, &c.

FORKS, and long four or five tin'd CROOKS, are wanted to pull out the roots of the sedge, rushes, reed, &c. which grow in the large mains and drains. The crooks should be made light, and have long stems, to reach wherever the water is so deep, that the workmen cannot work in it.

### STOUT LARGE WATER BOOTS,

Whose tops will draw up half the length of the thigh, are indispensable; they must be large enough to admit a quantity of hay to be stuffed down all round the legs, and be kept well tallowed, to resist the running water for eight, nine and ten hours together.

The technical terms the Editor much

wished to have omitted, but that appearing improper, an explanation of them became necessary; for as in every science, names, and terms, peculiar to that science, are constantly adapted, so in this system, unless a distinct idea is affixed to distinct things, which can only be done by giving certain names to those things or terms; and those, once for all, explained by words familiar to every reader, there would be a disgusting circumlocution to become intelligible. This was the Editor's idea of it, and he presumes to offer it, as his apology. It is well known to every one, that, easy as the knowledge of terms, and things, may be, to those who are perfectly acquainted with them, yet for those who have never heard of the one, or seen the other, the utmost that can be said will hardly be thought satisfactory enough, to enable them to retain a clear and ready idea of them; for, without an explanatory part to refer to, there must be a considerable application, which is not only an unpleasant part, but also tiresome, and disagreeable. Those only are introduced, which were found to be indispensably necessary. The explanations barely sufficient to make them intelligible.

A WARE is an erection across a river, brook, rivulet, main, &c. made often of timber only, sometimes of bricks, or stones and timber, with from two to eight, or ten thoroughs (openings) to let the water through,

through, according to the breadth of the stream. Its height is always equal to the depth of the stream, compared with the adjacent land. Its use is, when the hatches are all in their proper places, to stop the whole current, that the water may rise high enough to overflow the banks, and spread over the adjoining land ; or by stopping the water in its natural course, turn it through mains cut to convey it another way to some distant lands to water them. For a particular description of each part, and the dimensions, see Plan Fifth.

A SLUICE is made exactly as a ware, only it has but one thorough, for if there are more than one, it is called a Ware. Its use the same as a ware, only this is set across small streams, mains, &c. as the other is across large ones.

A TRUNK is made for the same purpose, as a sluice ; but being placed either where cattle, or teams are to pass over, or, when it is necessary, (which often happens) to carry a smaller stream at right angles under a larger one, to water some lands lower down, at a distance from the river, stream, or main ; it is made of timber, elm, oak, or deal four square. Its length and breadth are various, according to the purpose it is wanted for.

A CARRIAGE is made of timber (it should be oak) or of bricks ; if the latter, an arch is turned over the stream that runs under

it, and the sides bricked up; if the former, which it commonly is, it is constructed with a bottom and two sides, as wide and as high as the main it lies in. It must be made very strong, close, and well jointed. Its use is to convey the water in one main over another, which runs at right angles with it; its depth and breadth are of the same dimensions with the main it belongs to; its length is in proportion to the breadth of the main it crosses. Wherever it is necessary to have one, it is the most expensive conveyance belonging to watering.

A DRAIN SLUICE, or drain trunk, is always placed in the lowest part of some main, as near to the head as a drain can be found, that is situated low enough to drain the main, &c. it is made four square of timber, as a trunk is, but only much smaller; it is placed with its mouth at the bottom of the main, and let down into the bank, and from its other end a drain is cut to communicate with some trench drain that is nearest. The dimensions and length are various; sometimes long enough to let a team pass over, at others no longer than just to prevent its being blown up by the water. Its use is (when the water is turned some other way to water other parts of the meadow, by means of the hatches being put into the ware where it is intended to prevent its coming through) to convey the leaking

leaking water that oozes through the hatch-  
es, &c. into the drain, that otherwise  
would run down to the tails of those tren-  
ches which lie lowest, and there poach and  
rot the ground ; and probably contribute,  
not a little, to the making it more unsound  
for sheep.

No part of watering requires more at-  
tention than this ; for if the water is not  
drained thoroughly off the land, when it  
is designed to be laid dry, the work is but  
half done ; the meadows are rotted ; and  
when the hay comes to be carried over these  
places, the wheels sink, the horses are  
mired, and the load is yet fast sometimes  
for hours together ; but when the drain  
trunks are properly placed, there is no wa-  
ter left in or about the tails of the tren-  
ches ; the land becomes firm, and sound,  
the teams perform their labour with ease  
and speed. A hatch must be fitted to the  
mouth of the trunk, to stop it close when  
the main is full.

HATCHES may be made of any timber,  
elm, oak or deal are the properest, their  
uses are to fit the openings in the wares,  
fluices, trunks, and drain fluices. And to  
keep back the water when necessary, from  
passing one way, to turn it another ; they  
should be made to fit as close as possible.

FLOOD HATCHES. And when these  
hatches belong to wares that are erected  
cross

cross large streams, or where heavy rains quickly swell the streams, and make them overflow their banks, when the hatches are in their places to water the meadows. A foot or more of those hatches is made to take off, and give vent to the water over the other parts of the hatches, retaining water enough to water the meadows, these are called Flood Hatches.

A head MAIN, is a ditch of different breadth, and depth, drawn from the river, rivulet, &c. to convey the water out of its usual current to water the lands laid out for that purpose; through the means of lesser mains and trenches. The head main is drawn of various sizes, according to the quantity of land to be watered; to the length, or to the fall or descent of the land it is cut through. It often happens, that

Smaller MAINS are taken out of the head main, and the only difference between them is, the one being much less than the other, and are mostly cut at, or nearly at right angles with the other, though sometimes many degrees less. The use of both the large and small mains is to feed the various trenches with water, which branch out into all parts of the meadow, and convey the water to float the land. These smaller mains are by some called Carriages, but improperly, for it is confounding them with

with the open trunk, called by that name, which see explained above.

A TRENCH is a narrow shallow ditch, made to take the water out of the mains to float the land with. It ought always to be drawn in a strait line from angle to angle, with as few turnings as possible. It is never made deep, but the width is in proportion to the length it runs, and the breadth of the pane, between that and the trench drain. It is always cut gradually narrower and narrower to the lower end.

French DRAIN is always cut parallel to the trench, and as deep as the tail drain water will admit when necessary. It ought always to be cut if possible, so as to come down to a firm stratum of sand, gravel, or clay. If the latter, a spade's depth into it will be of great advantage; its use is to carry away the water immediately after it has run over the panes from the trench. It need not be drawn up to the head of the land, by five, six, or more yards, according to the nature of the soil. Its form is the reverse of the trench, being narrower at the head, or upper part, and gradually wider and wider, 'till it comes to the lower end, and empties itself into

The Tail DRAIN. This is a receptacle for all the water that runs out of the other drains, that are so situated, as not to empty themselves into the river; and therefore it should

should run at right angles with the trenches, but in general, the preference is given to draw it in the lowest part of the ground, and so use it to convey the water out of the meadow where there is the greatest descent; this is generally found in one of the fence ditches, for which reason a fence ditch is mostly used for that purpose, answering these two intentions, fencing the meadow, and draining it at the same time.

A PANE of ground is that part of the meadow which lies between the trench and the trench drain, and is the part on which the grass grows that is mown for hay; it is watered by the trenches, and drained by the trench drains, consequently there is one on each side of every trench.

A Way PANE, is that part of the ground which lies in a properly watered meadow, on that side of a main where no trenches are taken out, but is watered the whole length of the main over its banks; a trench drain runs parallel with the main to drain the way pane. Its use is, for a road to convey the hay upon, out of the meadows, instead of the teams crossing all the trenches.

A BEND, is a stoppage made in various parts of those trenches, which have a quick descent, to obstruct the water. It is made by leaving a narrow strip of greensward across the trench, where the bend is intended

ed to be left, cutting occasionally a piece wedge fashion out of the middle of it. Its use is to check the water, and force it over the trench into the panes, which, if it were not for those bends, would run rapidly on in the trench, and not flow over the land, as it passes along. The great art of watering meadows consists in giving to every part of each pane an equal quantity of water.

A GUTTER is a small groove cut out from the tails of those trenches, where the panes run longer at one corner than the other. Its use is to carry the water to the extreme point of the pane. Those panes which are intersected by the trench, and tail-drains meeting in an obtuse angle, want the assistance of these gutters to convey the water to the longest side. Another use of them is, when the land has not been so well levelled, but some parts of the panes lie higher than they ought. A gutter is then drawn from the trench over that high ground, which otherwise would not be overflowed. Without this precaution, unless the flats were filled up, which ought always to be done when materials can be had to do it), the water will not rise upon it, and after the watering season is past, those places would appear rusty and brown, whilst a rich verdure would overspread the others, and at hay-time the grass in those

places would be scarce high enough for the scythe to touch it; whilst that around them, which has been properly watered, will from its luxuriancy lie down: though this method of treating those places is mentioned, it ought always to be reprobated; for every inequality in water meadow should either be levelled down, or filled up: here the waterman's skill is shewn, in bringing the water over those places where it could not rise of itself, and in carrying it off from others, where it would otherwise stagnate.

**A Catch DRAIN.** There is sometimes another method made use of to water the land when the water is scarce, and it is this, when a meadow is pretty long, and has a quick descent, the water runs swiftly out of the drains into the tail drain, running at, or nearly at, right angles with the trench drains, when there happens to be a considerable fall in the meadow; at a proper distance, this drain is close stopped below, consequently, the water flowing rises up higher and higher, either till it strikes back into the tail drains, so high as to annoy the ground there, (in that case it will not succeed, and must be cut open again to let the water free;) or till it flows over the banks of the drain, and waters the ground below; then the design succeeds, and (in proportion to the quantity of

of water thus collected,) it is to be conveyed upon the land, either in a small main, out of which trenches are to be drawn with their proper drains ; or by trenches taken immediately out of it.

It is proper here to remark, that even when this method succeeds, the water having been so very lately strained over the ground, it is supposed to be not so enriching as it was before it was used, and therefore nothing but absolute necessity can support the adopting it. The frequency of the practice the Editor thinks will justify his explaining it.

The Bed of a river, main, trench, &c. is the bottom of it.

A POND means water standing upon the land, or in the tail drain, trench drains, &c. so as to annoy the ground near them ; and is occasioned sometimes by the flats not having been properly filled up : and at other times when a ware being shut close to water some high ground above it, the water is thrown back upon the ground contiguous. In this case the lesser evil, which ever it is, must be borne with.

A TURN of water means so much land in a meadow as can be watered at one time. It is done by shutting down the hatches in all those wares where the water is intended to be kept out, and opening those that are to let the water through them.

The quantity of land to be watered by one turn, must vary with the size of the river, main, &c. as well as with the plenty, or scarcity of water. One certain rule may be laid down. " To have no more land under water at one time than the stream, &c. can maintain ; with a sufficient quantity of water regularly, that being guarded against, water as much as possible."

The HEAD of a meadow is that part into which the river, main, &c. first enter.

The TAIL of a meadow is that part out of which the river, &c. last passes.

The Upper side of a main or trench is that side which, (when the main or trench is drawn at, or nearly at right angles with the river, &c.) fronts the part from whence the river entered. Consequently

The LOWER side is the reverse.

The UPPER pane in a meadow, is that pane which lies upon the upper side of the main, or trench, that is drawn at right angles with the river : that is, when the river, &c. runs north and south entering at the north, and the mains, and trenches are drawn east and west ; all those panes, which lie on the north side of the main, &c. are called the upper panes, those on the south side are called the lower.

N. B. When the mains, trenches, &c. run parallel with the river, the panes on

*either*  
*or* *main drains* *together with only a small space between*  
*and so that they form a fence in the subdivision of a meadow*  
*in such contrivance, a bridge with hinges can be*  
*up a gate - channel 191.*

either side are not distinguished from each other.

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### C H A P. III.

#### *General Description of Water Meadows.—*

*Observations—Different Soils require more or less Water upon them, some a shorter, others a longer time.*

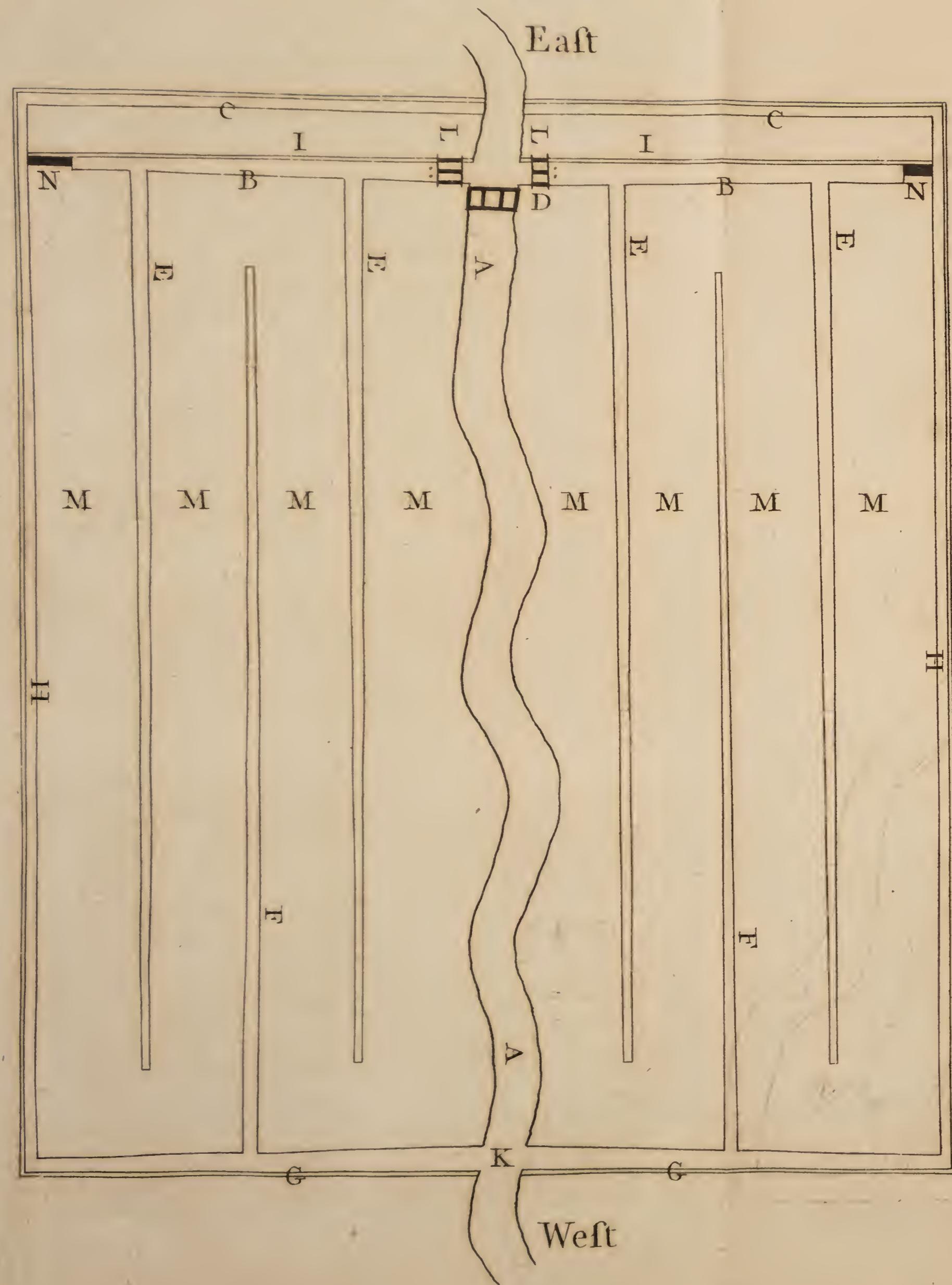
**L**ANDS capable of being watered lie sometimes only on one side, sometimes on both sides of the river, streams, &c. If the former, and a pretty quick descent, a main drawn out of the river will often water the land; without setting a ware across the stream. So likewise when the lands on one side of the stream are one person's property, those on the other another's, if the parties should not agree to settle the expences, a main cut out of the stream, &c. will prevent those attending the erecting a ware cross it. However, it is, by far, the best way to erect a ware, and draw mains on each side of it, to dispose of the water to every possible advantage.

Lands that are very boggy, require more and longer watering, than any sand or gravelly soils. The larger the body of water that can be brought upon them, the better.

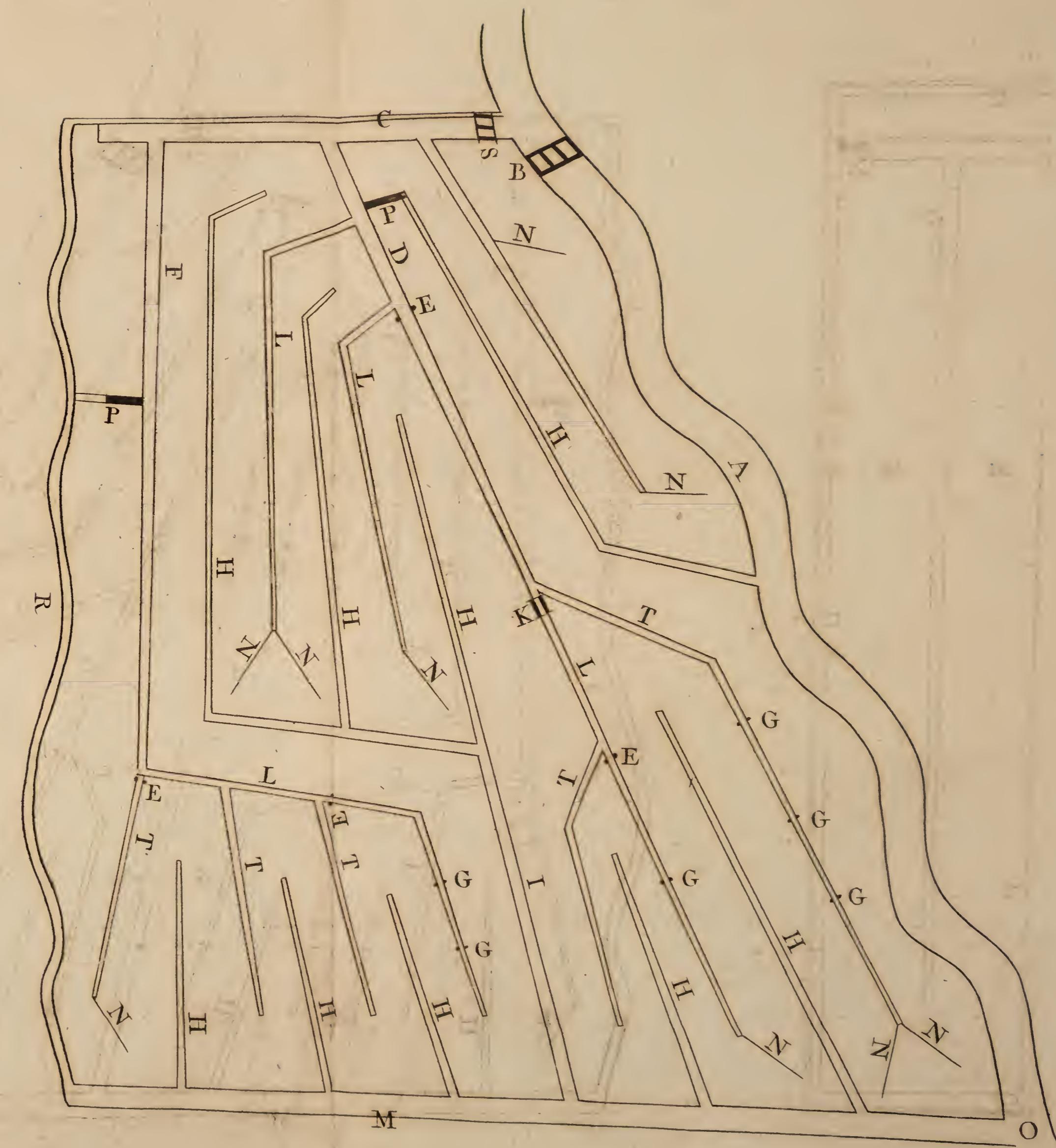
better. Its weight and strength will greatly assist in compressing the soil, and destroying the roots of the weeds that grow upon it; neither can the water be kept well too long upon it, particularly in the winter season immediately after the aftermath is eaten, (the closer it is fed the better.) This species of soil well watered, and drained, will equal the wishes of the most sanguine, by its improvement. To improve strong clay soils, the utmost endeavours must be used to procure the greatest possible descent, from the trench to the trench drain; and that is best done by making the trench drains as deep as possible, and applying the materials drawn out of them to raise the trenches. Then, with a strong body of water, taking the advantage of the autumnal floods, and keeping the water some time upon them, at that season, and as often as convenient in the winter; the greatest improvement on this sort of soil may be made. Warm sand, or gravelly soils, are the most profitable under the watering system, provided the water can be brought over them at pleasure. The method of watering these is the reverse of the other. The water must not be kept long at a time upon the land, but often shifted, thoroughly drained, and the land frequently refreshed with it, under these circumstances, the profit is immense.



## *Plan I.*



## *Plan 2*



immense. A spring feeding, a crop of hay, and two aftermaths, or eddish's, may be obtained in a year. And this probably, where, in a dry summer, scarce grass enough could be found to keep a sheep alive. Attend to the size of the river, stream, &c. whether it be large, if it be, and runs rapidly, any quantity of land almost can be watered by it. The expence of a ware over such a one is great, but the improvement will repay it. If it is not a large stream, a ware may be erected at an inconsiderable expence.

## C H A P. IV.

*A Meadow watered regularly from a Stream running through the middle of it.*

PLAN I. *A Meadow watered on each Side of the Stream — Explanation of every Part of the Work—Observations—A Remark explained.*

A. A. THE river running through lands capable of being watered on both sides.

B. B. Two mains drawn at right angles with the river, one running north, the other south, cross the meadows to within about six yards of each fence, that bounds the meadows on the north side of the one, and the south of the other.

C. C.

C. C. The fence ditches at the head of the meadows ; and are used for tail drains to convey the water that runs over the way panes II, watered from the upper side of the mains BB ; by these fence ditches the water is conveyed into the side fence ditches HH, and from them to the tail drains or lower fence ditches GG, and is discharged by them into the river A again at K.

D. A ware erected cross the river to force the water into either of the mains BB, which is done by shutting the ware D close.

L. L. Two wares erected at the mouth of each of the mains BB ; their uses are, when the ware D is shut close, and there is not water enough, or it is not convenient to water both meadows at once. By shutting close one of these, the current is forced into that main, whose ware is open ; from thence to be conveyed through the trenches over the panes, to water the meadow ; then by shutting that, and opening the other, the opposite main B is filled, and by means of the trenches that meadow is watered in the same manner, and lastly, by shutting them both, and opening the ware D, the water flows in its usual course, and the land on both sides is laid dry.

E. E. E. E. Are trenches taken out of the mains B.B, and conveys the water over.

M. M. M. M. M. M. M. Which are the panes or parts of the meadows that produce the grass, and for the improvement of which all the labour and expence is taken.

F. F. Are French drains to draw off the water from the panes, and convey it into the tail drains; why there are in these meadows four trenches, and only two french drains, is because the north and south fences ditches are substituted as two, for the two outside trenches, and the river as two more for the two inside trenches, the trench drains empty themselves into.

G. G. The west fences of the meadows and in this plan are used for tail drains to convey the water into the river.

K. The place where they discharge themselves into the river.

N. N. Two drain sluices, one at the lower end of each main; their use, when the wares L L are either or both of them shut close; these drain sluices are opened to convey the leaking out of the mains into the fence drains H H to keep the land dry and healthy.

I. I. Are the way (or read) panes watered from the banks of the mains B B, the whole length of the mains.

F

This

This is a plan of a regular water meadow, that is of equal length, and equal breadth. The number of trenches and trench drains will be in proportion to the breadth. This may be considered as the standard for the laying out all water meadows that never were watered; deviating from it only when the scite of the land makes it necessary. To a person unacquainted with water meadows, it may appear difficult to know how the tail drains G G can discharge themselves into the river at K, without being liable to have the water strike back into the trench drains, and annoy the tails of the panes. For their information let it be observed, that the ware D being close bended, the water in the river is very low or shallow during the time the meadows are under water; and when the river is full, there is no water upon the meadows. But because few meadows are so situated as to admit of being laid out regular, the next plan is a deviation from it, and shews how to water a meadow whose works must be drawn out irregularly,

## C H A P. V.

*A Meadow irregularly watered. The Stream passing by the Side of it.*

PLAN II. *A Meadow watered by a Stream running on one side of it—Explanation of the different Works — Observations upon them—Remarks.*

A. THE river, B a ware erected cross the river.

C. The head main taken out of the river above the ware B.

S. A ware erected across the main C, to be kept close when the meadow is not watered.

D. A smaller main taken out of the head main C.

F. Another small main taken out of the head main C.

E. E. E. E. Bends made in the small mains, and trenches just below the places where the branch trenches are taken out of them. Their use is, to check the water at those places, and force a proper quantity into those branch trenches.

G. G. G. G. G. Bends made in those branch trenches, which have so much descent, that were it not for these bends, the water would run down almost to the end of the trenches, before it would flow over upon the panes.

H. H. H. H. H. H. H. Are trench drains to convey the water off from the panes. There should be one on each side of every trench unless a fence ditch, or the river can be used instead of them.

P. P. Sluice drains, to convey the leaking of the water out of the mains D and F.

L. L. L. L. Trenches taken out of the small mains, to convey the water into the various parts of the meadow, which at the lower part increases in width.

T. T. T. T. Branch trenches taken out of the other trenches.

N. N. N. N. N. N. N. N. Various gutters taken out of the ends of some of the trenches, to carry the water to the longest corner of the panes : Sometimes taken out of different parts of the trenches, to water some little irregularities in the panes, which without such assistance would not have any water upon them.

I. A master or considerable drain, into which several others empty themselves, and from thence run into the tail drain. This drain is frequently necessary, for whenever there are any hollows or flats in the meadow, and those deep, the expence would be immense to fill them, if materials could be had, which seldom can, to do it ; to lessen this expence, the trenches are drawn upon the high ground, and a master drain in the flats to carry off the water.

K. A sluice erected at the end of the small main D, to force the water into the branch trench T. that being the highest ground.

M. The tail drain which receives all the water from the other drains, and conveys it into the river at

O. The point where the water from the tail drain runs into the river.

R. A fence ditch, being the bounds of the meadow on that side, and used also as a drain to convey the water into the tail drain.

In this meadow there is no particular part appropriated for a way pane ; from the form of it, there could not ; besides, a great deal depends upon the situation of the meadow in respect to the stack, or farm-yard. One general rule may be here given. Observe in the trench drains, whether there is any gravel or firm sound bottom, endeavour with the teams to come with the loads to those places. In a subsequent plan more particular notice will be taken of the way pane. All trenches must have drains running nearly parallel with them. Mains when they are used for the purpose of trenches, must have drains to them, to take off the water from the panes.

A fence ditch, either to divide the property of different proprietors, or to subdivide lands, if it is drawn at the bottom of the

the meadow, is sometimes used as a tail drain to the way pane, and sometimes for the main itself, just as the work happens to be cut out at first. For instance, if in this plan a hedge were planted upon the upper bank of the main C, the main would be the ditch to it. Although this is mentioned here, because it is frequently to be met with in old watered meadows, yet it ought not to be imitated; for when the hedge grows up, the roots of the various trees, shrubs, &c., spread down to the water, the high winds shaking the plants, loosen the earth around them, the water finds a vent into the ditch on the other side; and when that happens, it is exceeding difficult to stop it afterwards. Besides the hedge is a refuge for rats, moles, and other vermin; these burrow into the bank, make it hollow, and the water soon finds a way through, and quickly makes a considerable breach, by which a great deal of water is wasted; and in a scarce season of water the damage sustained is very considerable: this is entirely remedied, when the main is drawn at a certain distance from the hedge, the ditch is both a drain to the pane on that side the main, and a defence against the cattle for the planted hedge.



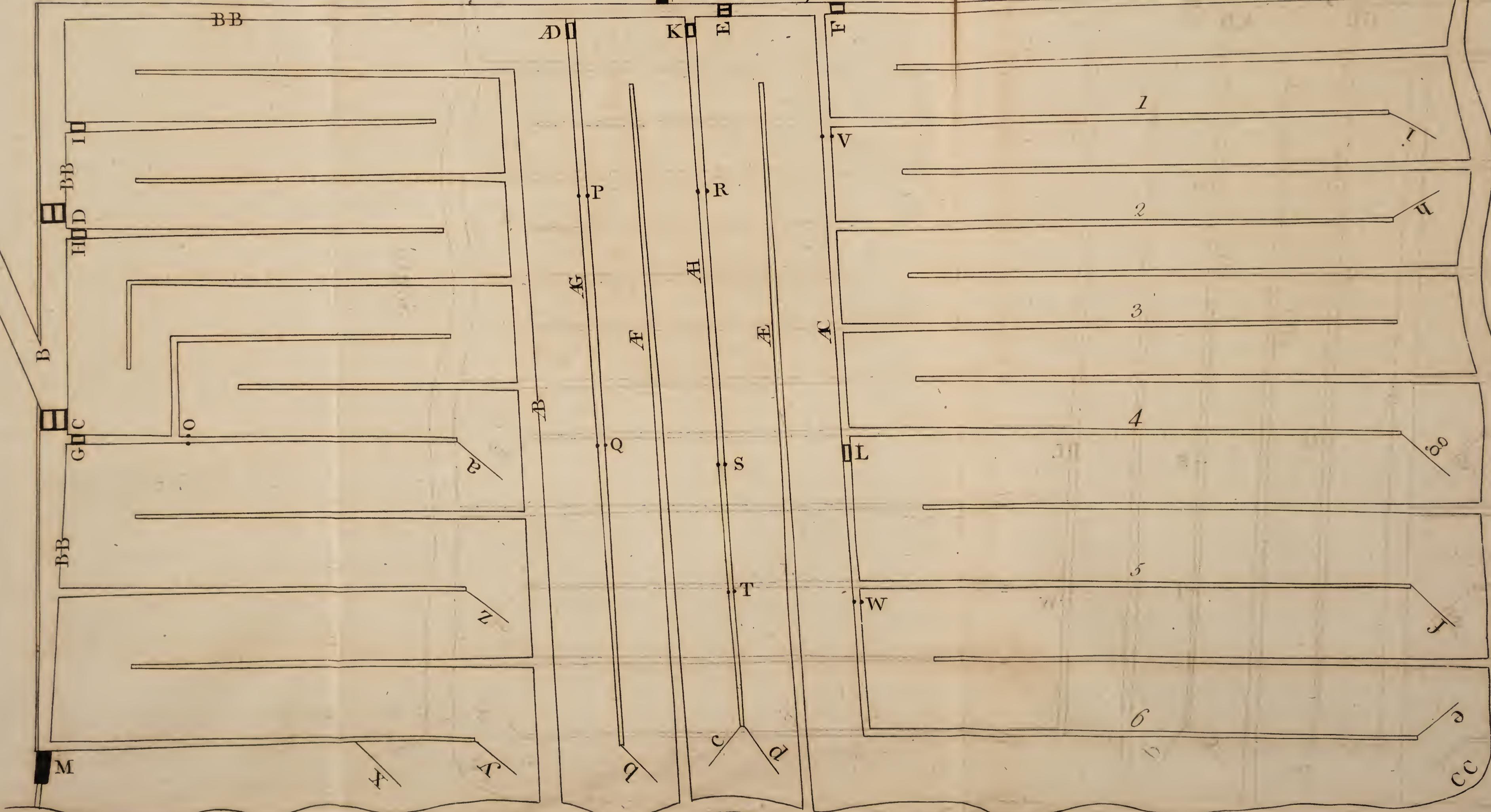
Plan 3.

North

East

South

West



## C H A P. VI.

A Meadow watered by a Head Main taken out of the River a considerable Distance above it.

PLAN III. Watering a Meadow by a Head Main, taken out of the River a Distance above it, without erecting a Ware across the River—Explanation—Reasons for this Method—Turns—How performed—Observations—Remarks.

A. THE head main taken out of the river a considerable way above, forming an angle of about sixty degrees. The descent of the land permits the main to overflow it at

B. The point where the meadow can be watered; consequently the place for the main B B, to be drawn at right angles with the stream, the whole breadth of the meadow intended to be watered, excepting about five yards at each end.

C. D. Two wares erected to turn the water either way, or when both are shut, to keep the water in its proper current.

E. Another ware for the purpose of dividing the meadow into turns.

F. G. H. I. K. L. Sluices to convey the water into, or stop it out of the trenches, as it may be found necessary.

M. N.

M. N. Two drain sluices ; their uses are, as before described, to carry off the leaking water, when the wares at the mouth of the mains are shut.

O. P. Q. R. S. T. V. W. Bends to stop the water in those trenches which have the quickest descent. Without these bends the higher ends of the panes would not be watered.

X Y Z abcdefghik, gutters to carry the water to the ends of the panes, and little irregular parts in the meadow.

C. C. The lowest part of the meadow. Here the tail drain discharges it, and it is conveyed away through some low ground.

This meadow is watered differently from the plans already given. The river is supposed to be a large one, and to erect a ware across it, would cost a considerable sum. To prevent this, the head main is taken out of the river, as far up as possible, on that side of it, where the land intended to be watered lies. The breadth must always be in proportion to the quantity of ground to be watered, regard being had to the rapidity of the current ; or which is the same thing, in proportion to the descent of the land ; when the water flowing in this head main, rises to the edges of the land, that is, the spot where the main may be drawn at right angles with the river, consequently will form the same angle

angle with the head main, as that does with the river above.

Another observation will in this plan strike the Reader, which requires an explanation, that is, one part of the meadow is watered north and south; another east and west; and a third north and south again: vast irregularities will frequently be met with in lands designed, and very proper, for watering, which it would be impracticable to fill up; from the want of materials, and the great expence attending it: neither is necessary, if care be taken to bring the trench and trench drains in their proper places. In the plan now under consideration, from the main BB to the principal drain AB, the meadow is watered regularly, but betwixt that drain AB and the small main AC, there is a great flat. To fill it up would be the regular method, so that the trenches taken out of the main BB, should go down to the end of the meadow, to avoid that expence, the main BB is continued down on the east side of the meadow, 'till it has passed the flat ground to F. Materials being had from the drains, &c. to raise the ground enough to convey the water in the main on to F, which being the high ground, it is then carried east and west, the same as the main BB. Trenches are taken out of it, to water the lower part of the meadow.

dow. Trenches are also drawn out of the main, that runs north and south, to water the flat part the opposite way; with drains between them to carry off the water into the west fence ditch; at E a ware is built to stop the water, and turn it into the trenches above it: at F a sluice is placed to turn the water into the main AC. For the same reason, the sluices AD and K are set at the mouths of these trenches, to force the water down to the lower division of the meadow. The trench drains AE and AF convey the water from the upper pane of the main AC, and also from one of the cross trenches AH. And AF and AB do the same from the other cross trench AG.

To water this meadow it will be necessary to divide it into two, or perhaps three turns, if water should be scarce. One turn will be made by opening the ware C, and shutting that at D, the sluices G and H being also opened, the water will flow over the lower side of the main BB from D to M, down all those trenches that are taken out of it; and will be carried off, from the trench drains, by the principal drain AB to CC. Thus will that part of the meadow be watered. Another turn is made, by shutting the ware C, opening D, and shutting E. The sluice H being stopped, and the sluices I AD and K opened,

ed, that division of meadow from the ware D to E will be watered, and the panes on each side of the main BB also by the water flowing over its banks as it passes along, which is carried off on the one side by the river, on the other by the principal drain AB; and also from the panes on each side of the trenches AG and AH, by the same drains AB, and the trench drains AF and AE, into the west fence drain to CC. The other turn is made by shutting the sluices I AD and K, opening the ware E, and so much of the sluices F and L, as will let water enough through to supply the trenches below them, keeping that at F partly in, to turn the water into AC, and that at L the same also, partly to check the water, and force it over the sides of the small main AC, and into the trenches 1, 2, 3, 4. The reason for putting the sluice cross the small main AC at L is, that part is supposed to be flat ground from L quite to CC, consequently the water would, if not prevented, run so fast down to the ends of the trenches 5, 6, as to draw all the water off from the high ground from L upwards. The small main AC is too wide to be checked by a bend at that place, besides, it would not answer so well to regulate the quantity of water necessary to water the panes from L to CC, and it is on the account of those trenches 5, 6, that a

fluice is built. Another observation occurs here. This plan differs also from the rest, by the tail drain not emptying itself into the river ; but, at the opposite corner is conveyed away elsewhere ; this frequently happens, either by there having been formerly fence ditches made, to divide different proprietor's lands, or some other reasons, such as natural flats, drains cut to drain the lands, &c. besides, it must be remembered, that these meadows cannot be drained into the river, for the water in the river may be so near the surface of the meadow, as not to permit a tail drain to be drawn deep enough to convey the water from the various drains that may have been cut through the flats ; neither is it to be desired, for another reason ; the water which runs out of this meadow at CC is, if the descent is quick, immediately made use of, to water the next meadow below, or if there should be but little descent, it is oftentimes considered as a head main, and wherever below, it will rise over the land, it is again made use of, in the same manner, as it was at first in this plan.

These are some of the various plans that may be drawn, to water the coarse lands, near the banks of rivers, or small streams by individuals : another field here presents itself, which it may not be thought im-  
pertinent

pertinent just to mention. Where large tracts of lands are so situated, as to be capable of being watered, and belong to various owners, the most effectual method of watering them, both in point of planning, execution, and expence, is by an agreement entered into by all the parties concerned, at their joint proportionated cost, under one general plan. In that case, an agreement must also be entered into, for the time each meadow, or meadows, is, or are, to be watered, how long, &c. &c.

In the counties, where the watering of the meadows is most used, it is not unfrequent to find meadows, which are called common meadows, from the after-share, after-grass, after-math, eddish, or egrass, as it is variously called, belonging to the tenants in common; (the fore share or hay being the private property of a number of individuals) as regularly, and as well watered, as any other meadow whatever; this is done by an agreement, affixing a time when the common stock shall be taken out of the meadow; that all expences attending wares, sluices, works, &c. shall be paid for, by a proportionate rate; that each turn of water shall begin on such a day, last so long, and then the next turn begin, &c. It also very commonly happens, that a main shall be taken out of a river half a mile, before it can be used to any

any advantage ; and then be employed to water fifty, or an hundred, or more acres of ground, the property of four, five, or six different people, each person's meadow being private property ; an agreement is entered into, when the time of watering begins, which is usually about the middle of November, (though sooner would be better.) The main is continued at the head of each person's meadow, from the highest, or first, to the lowest or last meadow. The first meadow has the first turn of water, in proportion to the acres it contains, compared with the general number of acres watered ; seldom less time than a week, nor longer than three, the second, the next turn, and so on to the last : then the first takes its turn again, &c. the division of the time must be so made, that it may return to the first meadow again, in eight or ten weeks at the utmost. These turns are strictly attended to, whether there should be a scarcity or plenty of water. Numberless are the modes of agreement made both in regard to time, and manner, &c. which cannot be here enumerated. Proprietors of lands, who shall be disposed to unite in a scheme of this kind, will find it necessary to employ a person versed in the practice of the manual part, (for the planning, and laying out, they are advised particularly to attend to

the

the directions to be found in these sheets, themselves.) Such a person will be properest to make all these regulations. A few remarks may here be made, which are also, equally applicable to every plan. Particular care must be taken, that the trench drains run without any impediment into the tail drains, and that those are drawn, as deep as possible, that when the flats, or hollow parts cannot be filled up, care must be taken, that the trenches are carried in such manner, that the trench drains may be drawn through those flats to prevent the water standing in ponds, in any part of the meadows. That there be as much fall as possible given, betwixt the trench and trench drain. That two trenches never work against each other, but that there is always a trench drain between them. That the faster the water, after it is forced upon the panes, is carried off the better. That when the water is turned out of the meadow, it should be laid dry immediately. That the meadow should not be kept too long under water at a time; for in the words of that very valuable author Blythe, “ The land should be kept in a thirsty, rather than a glutted state”, particular directions for which will be given in some future chapter.

## C H A P. VII.

*Planning a Meadow of eight Acres, an actual Survey. — Introduction — Directions for Planning the Work — Observations and Advice upon it — Remarks explained.*

*Plan IV. An actual Survey — Explanation of the various Works — their uses, and reasons for them — Observations and Remarks examined, and explained — Objections refuted — Turns of Water how performed.*

**H**AFFY would the Editor of these sheets think himself, were he able to make this very necessary part of his design, more intelligible, and perspicuous, than, he is conscious, it will be found. Without scarce any assistance from other writers, he has dared an “attempt” upon a subject, which as far as he knows is perfectly new in print. The best apology he can make for it, next to its having had the approbation of a gentleman, whose extensive knowledge, and great experience, in the subject, enable him to be a proper judge; is, that it is not, as has before been hinted, the product of a hasty determination, or meer chimeras of the brain, but the result of some years experience, and of actual surveys, taken upon the spot, executed under his eye, and for his own use. That it contains all the various erec-

tions,

tions, works, &c. that are commonly to be found in the practice of watering meadows, that his intention in offering it to the public is to assist, not amuse; to direct, not mislead; and to instruct, not deceive, the industrious farmer.

If he has in any degree succeeded, he is satisfied.

A river running from the west to the east, was found to have a considerable quantity of land on the north side of it, that might be watered, if a stream could be brought from the river, to run on the north side of the land; and the fall or tail drain would be at the south-east corner of each division of the lands, for they were the property of many persons. Most of these meadows were longest from north to south.

In order to lay out any piece of land properly, for watering, it is particularly recommended, to examine it attentively, going round, and over, every part of it often; to make a rough draft upon the spot, to mark where the flats and risings are; and also every remarkable obstruction upon the draft; to examine whether one can easily be filled up, another taken down, and a third removed. Note each of those separately on it. Observe those that cannot, and mark them also; for when the ground cannot be formed upon a regular

plan, the water must be conveyed over the highest parts some other way. Sketch out another draft of the intended mains, trenches and drains. Reduce them by admeasurement to their proper distances. Examine them upon the spot where they are to be made, each attentively. Vary, according to the scite of the land, the distances from trench to drain, and from trench to trench. Correct errors, amend, and alter the plan; till every difficulty appears to be removed. Being provided with a number of small straight white sticks for objects, proceed to set out the main; three must be used to form a straight line, do the same for every trench and drain; observing, that the trench does not extend quite down to the end of the pane, nor the trench drain quite up to the main.

Having thus gone through them all, examine the meadow again, alter, correct, and amend, wherever a new thought presents itself. Leave it for a few days, then examine it again, entering the meadow at a different part, go over the whole in a contrary direction from the first. Note the remarks that occur. Do the same again in some other direction. Compare these various observations together, for being thus collected in one point of view, the most probable chance of the best plan will be obtained. Let it be observed, that although

although it is recommended to owners of these coarse lands, to be particularly attentive themselves to the laying out such lands for watering, and for whose assistance and instruction these minute directions are given. It is by no means meant to exclude that assistance, which may often times be obtained from skilful workmen. The design is to guard generally against their self-confidence. Every person, who has employed the labouring part of mankind must have experienced, that when ever it has been found necessary, frequently to ask their advice, they soon forget their situation, and presuming upon their consequence, grow quickly impertinent. Besides, though many workmen may be met with exceeding clever in the execution, and even in the direction of the work, yet in general so confused are their ideas, that they are unintelligible, and their mode of directing unsatisfactory, being mostly conducted without a plan, and executed as incidental circumstances arise, still blundering on with the work they have begun; many trenches and drains are cut improperly, the result of all which is, an incomplete performance at first, and every year after emendations and alterations follow, some for the better, but many for the worse, to the great disfiguring of the meadow, extraordinary expence to the owner,

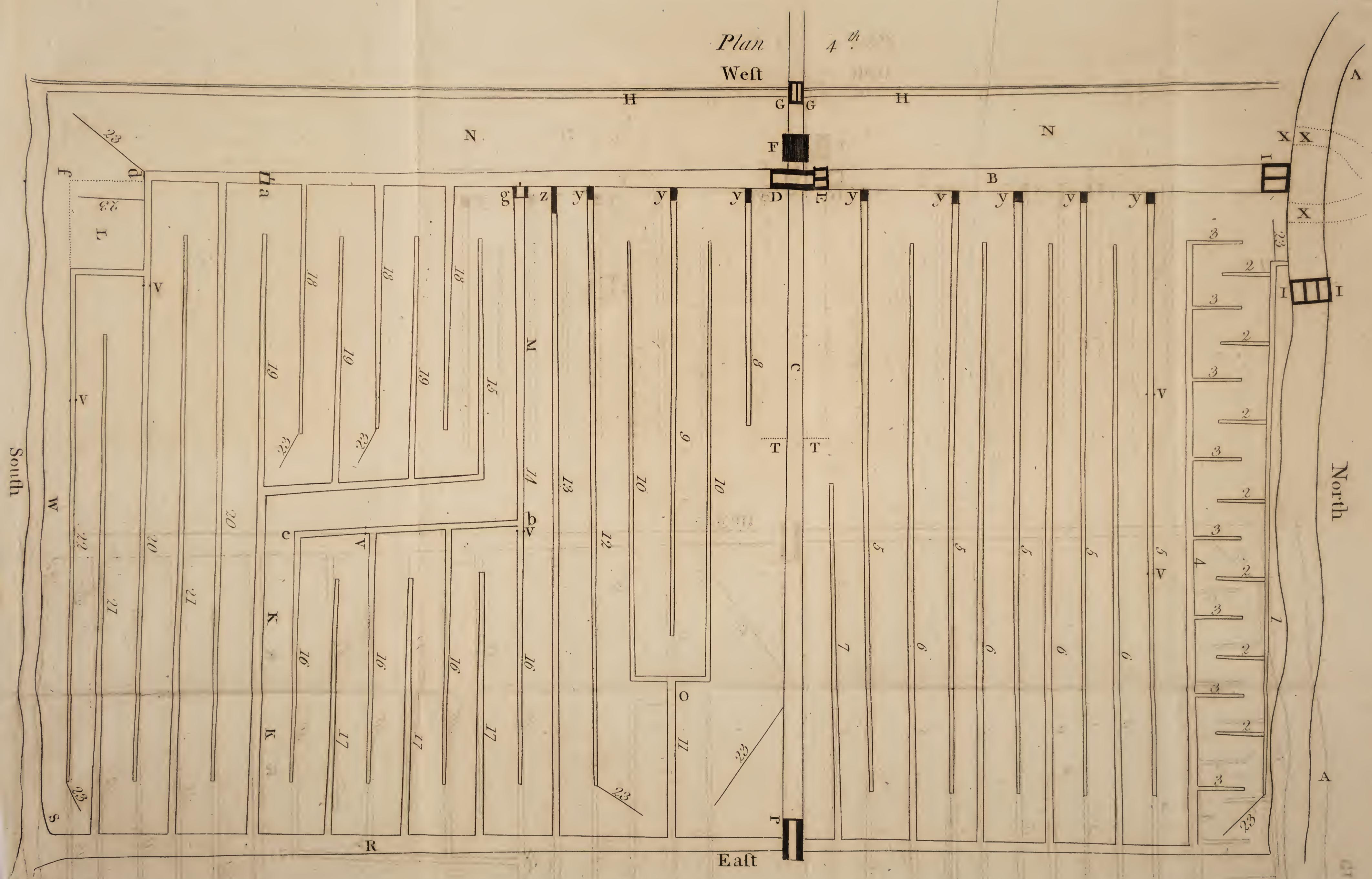
as well as betraying the ignorance or want of skill in the undertaker. But in the execution, or manual part, it is but justice to them to own, they will be frequently found, both dexterous, and ingenious, and much useful information may be often gained from them. 'Tis their want of thought, barrenness of invention, confused ideas, &c. that have been here condemned.

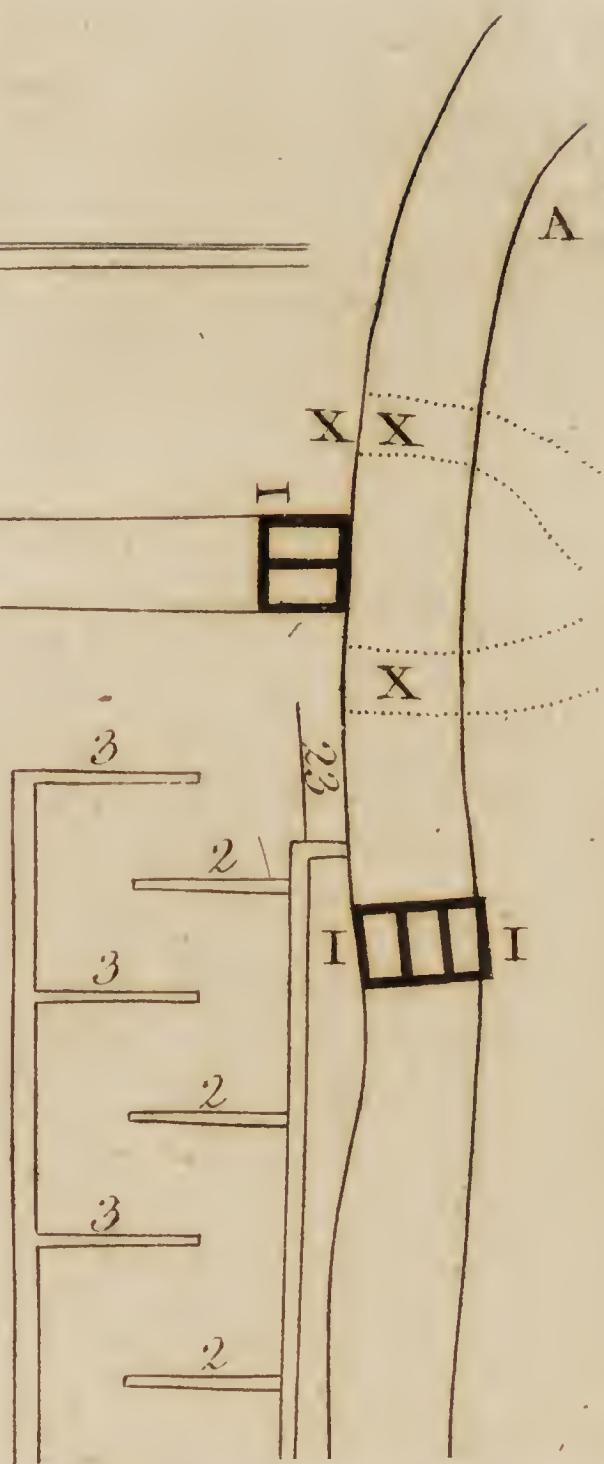
**PLAN IV.** *Is a meadow watered by an agreement with persons owning other lands through which the stream is brought, each using the water at stated times.*

A. The stream drawn out of the river a considerable distance above. Every separate meadow upon this stream must have a main taken out of it, to water it, because there being a fence and ditch betwixt each, the water cannot be conveyed out of the one into the other, but must have a main to each. In some of these meadows the main runs close to the west fence, and they have no way pane in them; but in this plan, there is a way pane, betwixt the fence, and the main, for the reasons already given in Plan 2. Chap. V.

B. The main drawn at right angles with the stream, and running parallel with the west fence.

C. A main drawn cross the middle of this meadow, at the request and expence, of





of the proprietor of the meadow next below it, to bring the water of the upper parts of several meadows above, athwart this, and by the natural fall in the ground, it becomes capable of being made use of, to water some part of that meadow.

D. Is a carriage well joined together, and made of timber, or bricks. Its breadth, and depth, are the same as the main B, of which it is a part, its use is to convey the water in the main B, over the water in the above described main C, and is erected and maintained, at the expence of the proprietor of the meadow below, for this obvious reason, that, if the main C, (which is upon sufferance) were not there, the carriage D, would not be wanted.

E. A ware erected across the upper part of the carriage D, by which the meadow may be watered in two turns, the one above the ware, the other below it.

F. A bridge made of timber, or bricks, over the main C, in the way pane N, for the teams to bring over the stay from all the lower part of the meadow, and so come through the river with it (above the main) at X. X. The bridge is built, and maintained by the proprietor of the meadow below, for the same reason that the carriage D is.

G. A trunk to convey the water in the main C, under the water in the head fence drain

drain H. H. It is also erected, and maintained, by the same person.

P. A carriage made of timber to convey the water in the main C. over the water in the tail drain R of this meadow, into the meadow below. This is also erected by the same person, and for the same reason.

H. H. The west fence ditch, and as a drain to carry off the water that flows over the way pane N N, from the bank of the upper side of the main B.

I. I. A ware erected across the stream A, which when shut forces the water into the main B.

I. A ware erected across the main B, which, when shut, prevents the water from coming into any part of the meadow, and keeps it, in its regular course, for the use of the meadows below.

M. Is a large trench taken out of the main B, and runs east and west part of the way, then it turns, and runs north and south; afterwards east and west again. To explain this, from the trench drain 15 to the south trench drain 19 was very high ground; and betwixt the ends of the trenches 18, 18, 18, and the east part of the large trench M, there was a very considerable fall or flat. The high ground was levelled down, till it would admit of the water flowing over it, from the main B,

by

by means of the trenches 18, 18, 18, and the materials conveyed into the flat part, but it was found impracticable to convey the water, by trenches drawn straight thro' as the others were, for want of materials. A principal drain was drawn in the flat, and the trench M, carried upon the highest ground south of it, and the branch trenches 16, 16, 16, 16, with their trench drains 17, 17, 17, were drawn, to water that part of the meadow.

K. K. The principal drain to carry off the water from the trench drains 15, 19, 19, 19, which are upon the high ground.

N. N. The way pane watered from the drain B, and drained by the fence ditch H, having no trenches or drains across it. The use is, for a road to carry the hay out, from all the lower part of the meadow, instead of crossing all the trenches with it, and also to prevent the vermin from letting off the water by their burrows, when the main is in the fence ditch.

O. Two trench drains thrown into one, the land being very low at that spot. Whenever materials can be had to fill it up, it will be done; the trench 9 will be brought lower down, and the trench drains 10, 10, cut straight through, which is the regular and proper method of doing it.

T. T. The place in the main C, where the water, when the ware in the meadow below

below is shut close to water some part of it, begins to flow over the banks ; consequently from thence, to the tail drain R, it will water the pane on each side of it, and will be drained off, by the trench drain 7 on one side, and O on the other.

B. The tail drain and the lower, or east fence ditch. It carries off all the water from the trench drains, and discharges it at the lowest, or south-east corner.

S. The lowest corner of the meadow, and the place where all the water goes off, into the meadow below. It is afterwards diverted to the purposes of watering other meadows below, and is used again and again.

V. V. V. V. V. Are bends, to prevent the water running down the trenches too fast ; and are always used where the descent is considerable, and to turn the water into the branch trenches when necessary.

X. X. X. Are two roads across the stream, one above, and the other below the main B, to carry the hay out of the meadow. Whenever a road crosses a river, or stream, the banks must be sloped away, for a considerable distance, and gravelled, to let the teams easily into, and out of, it ; but care must be taken, that the sides of the ford are raised high enough to prevent the water flowing over them ; when the ware I. I. below it is shut close.

g. A sluice in the large trench M to regulate the water there.

y. y. y. y. y. y. Are small trunks set in the mouths of the trenches. Their use is, to let the water into some, and keep it out of other, trenches, just as it may be found necessary, either from a plenty, or scarcity of water. It is not absolutely necessary to have those trunks; because piles drove in; and large clods of green sward are often used, because less expensive, but the advantages of the trunks are so obvious, that it is needless to say more about them.

Z. A drain sluice; or drain trunk, for it is sometimes made open, as a sluice; at others close and covered over as a trunk. Its use is to drain the main B quite dry, when the water is turned out of the meadow.

a. A sluice at the extreme part of the high ground in the main B. Its use is, to check the water there, and force it over the banks, at the same time letting enough down to water the part of the meadow below; without this sluice the water would draw down to the lower end of the meadow, and not flow over the high ground between a and Z.

Number I. A trench taken out of the river A just above the ware I, I, and running parallel with it. If this trench had

been taken out of the main B; it would have passed so close to the bank of the ford below the main; that it would have been obstructed by it.

2. 2. 2. 2. 2. 2. Smaller trenches taken out of trench I.

3. 3. 3. 3. 3. 3. 3. Are trench drains to those smaller trenches, all of them discharged into,

4. A principal drain to those small trench drains.

5. 5. 5. 5. 5. Are trenches taken out of the main B.

6. 6. 6. 6. Are trench drains to them, discharging themselves into the tail drain R, as all the others do.

7. A trench drain to that part of the main C below T.

8. A trench to convey the water as low down as T, from which place the main C becomes a trench to the pane downwards, and a drain to it upwards.

9. A trench which does not run so low down as the others, because of the hollow or flat O, where the trench drains.

10. 10. Unite and fall into the tail drain, by the drain.

11. Which conveys the water into the tail drain R.

12. A trench.

13. A trench drain cut up quite to the main B; at the mouth Z, a drain sluice is

is set; this is to draw the main B dry, when the meadow is not under water.

14. A large trench with a sluice at its mouth, to regulate the water. This trench runs different from the others, because of the flat ground where the principal drain K is drawn, it therefore turns at

b. And runs parallel with part of the principal drain K, by this means the low ground between M and K is watered, and at

c. It turns again, and runs parallel with the lower part of the drain K; thus all the pane on the east side of the principal drain K is watered.

16. 16. 16. 16. Trenches taken out of the large trench M.

17. 17. 17. Trench drains to carry off the water from those trenches.

18. 18. 18. Short trenches taken out of the main B, this was the high ground before noticed.

15. 19. 19. 19. Trench drains to them.

20. 20. Trenches which run across the meadow.

21. 21. Trench drains to them.

22. A branch trench taken out of trench

20. The south fence ditch is the lowest drain to that trench.

23. 23. 23. 23. 23. 23. 23. 23. Gutters to convey the water to the extremities of the panes, from the ends of the trenches, and also wherever any irregularities

ties are found in the panes, they are drawn, without which the water would not touch those parts.

d. The point where the main B ends.

f. The point where the main B and the trench 22 should have joined, but from d to the south ditch fence the ground is very flat; if the main B had been continued to the point f, the banks must have been raised very high, to have conveyed the water into the trench 22; instead of that it is taken out of the trench 20, and carried upon the high ground, and the part

L is watered from the end of the main B, and the sides of the trenches 20, 22, by means of the gutters 23, 23.

W. The south fence ditch, into which the west fence ditch empties itself, at the south-east corner, the east fence ditch, which is the tail drain to the meadow, unites with this, and there run into the meadow below.

In examining the above plan, every part of it has been attended to with a minuteness, that may by many readers be thought needless, and tiresome. Yet whenever it is necessary to examine attentively, what any author has written to explain a subject quite new, he has not seldom appeared too concise; for this reason. Understanding the subject clearly himself, he concludes his readers will do the same; and it often costs,

costs, not a little pains, and attention to get a distinct idea of his work from his explanations. This is offered, as an excuse for the Editor's prolixity on this subject. It will probably strike the attentive reader that, according to this plan, the meadow might have been watered by trenches and drains taken out of the stream; running north, and south, and (supposing the main C. had not been carried across it) the expence of the main B. would have been saved, the teams would have passed regularly up, and down the panes, without going so much across them, and the trenches would not be near so wide as the main B.

To confute this remark, it must be observed first, that the trenches must not be drawn too long; an hundred yards should be the utmost length, if shorter the better, because in a considerable length, it is with difficulty, that the water finds its way down to the lower end of the trench: for weeds, leaves of trees, mowings of the trenches, and mains in the meadows above, and other extraneous bodies, will block up the passage: particularly when the grass is grown up, in the spring, and where that happens, the part of the pane, below the obstruction, is robbed of the water.

Another

Another observation, upon this remark is, that the longer the trenches run, the wider they must be, for the more surface there is in the panes, the more water is required to flood them, consequently the wider the trench must be to carry it.

A third observation, and also a satisfactory answer to the remark is this. If a meadow were watered by the trenches taken directly from the river, or stream, they must be drawn nearly at right angles with it. One of the panes of each trench will then front the side, from whence the river comes ; that is, will lie upwards ; therefore half the water flowing out of every trench ought to run over the pane which fronts the river head (or upwards) that is, it must be forced against the stream ; which is always done with some difficulty, never with much success ; because the impetus of the water will incline it, the way the stream runs, and the pane, that lies on the lower side of the trench will have the most water. It is thought necessary, to endeavor to explain this still more clearly, for no part of the watering system requires to be better understood.

All land by the side of rivers has generally a descent the same way the stream runs ; sometimes more, sometimes less, and this, though imperceptible to the eye, is found to be so much between the distance of the trench,

trench from the drain, that (were it not for the materials taken out of the drain being laid by the side of the trench) all the water would flow downwards, or the way the stream runs, and none on the other side, or upwards : and when all the materials that can be procured are not sufficient, to raise the trench high enough to make a regular descent from it to the trench drain, great part of the pane on the upper side, betwixt the trench and the drain, will be much flatter, than any other part ; for the higher a trench is raised, the greater will be the descent from it, to the drain on the side of the lower pane, therefore will require the most materials on that side, to back up the trench, otherways the water will flow faster over that pane, than the other. To apply this to the Plan.

The stream runs from west to east, on the north side of the meadow. The fall, or descent is with the stream from west to east, the south east corner the lowest part. If the trenches were taken at right angles out of the stream, they would be drawn from north to south. The panes to each would front the east and west ; it is therefore apparent, that those on the west side of the trenches face the part from whence the river comes, which is called upwards. Now for the reasons given above, it must be obvious, that the water running in the trenches,,

ches, will either from bends placed on purpose to force the water upon the panes, or from the quantity of water let into the trenches, for the same use; by its weight, and the impetus it has acquired, by being forced into the main B, incline more to the east, or lower side, than to the west or upper side: consequently the west panes will be robbed by the east. It is a known fact, that where lands happen to be thus laid out, there is more grass on the lower than on the upper pane.

One certain rule from hence may follow.

" That as few trenches as possible  
" should be drawn in this direction; and  
" when there is a necessity for it, the upper  
" pane should be the narrowest."

The way pane in this Plan is an exception, as well as part of the pane, that is watered by the trench M.

To form the main B, and raise its banks high enough to convey the water upon the high ground beyond the trench M, the materials drawn out were not sufficient; and to supply the deficiency, a considerable quantity was taken the whole length of the way pane from that side of it, next the fence ditch: consequently that was made considerably lower by it; but at an expense, much too great to execute all the trenches in the meadow in the same manner; besides, the loss of the greensward would

would be too great to be submitted to ; but in the way page it must be borne with, and indeed the materials must be had to raise the main to a proper height and strength, or the farther, (or south) part of the meadow could not be watered ; besides, “ of two evils it is the prudent part to bear with the least.” The reason that part of the trench M runs also in the same direction, has been already explained. The method of dividing this meadow into turns, for the convenience of watering it at different times, when there happens to be a scarcity of water, is thus performed. First, by shutting close the ware E, and opening all the trunks in the trenches marked 5 above it ; the ware II being shut close, and the ware I opened. Thus will all the meadow above (or on the north side of) the ware E be under water. A second turn is made, by opening the ware E, shutting the trunks of the trenches marked 5, and the sluices a and g, and the drain sluice Z, opening the trunks of the trenches 8. 9. 12. 18. 18. 18 ; thus will all the part of the meadow from the sluice a to the ware E, be under water, except the trench M. and its branch trenches 16. 16. 16. 16. Should there be more water, than is necessary for the proper watering of this part of the meadow ; the surplus may be let into the trench M, by opening the sluice g to a proper size ;

the same may be done by regulating the sluice a, to water the ground below it ; or the trench M, and all the ground below the sluice a may be made a separate turn in the same manner as the others were. The surplus water, if there should be any, in the first turn, may be let down by regulating the hatches of the ware E. Whenever there is water enough for all the meadow at once, it should be all taken ; this frequently happens in floods, or when there is a strong body of water. When the water is out of the meadow, and the ware I at the mouth of the main B shut close, the drain Z being opened, all the waste water will drain off there, and the meadow will be quite dry.

## C H A P. VIII.

*The Execution or manual Part of the Work.*

*The Main—Manner of setting it out—Performing the Work—Disposing of the Materials—Remarks—The trenches setting them out—Workmen's Method of drawing them—Disposing of the Sward—Forming the Trench—The Trench Drains, how executed—Materials coming out—Where placed—Observations—Large Trench, with its Branches—Manner of forming them—Principal Drain to them—How drawn—Reasons for it—Materials disposed of—Remarks—Bends, how made—Gutters, how drawn—General Observations.*

THE method of executing the manual part of the system will next be attempted to be explained.

A repetition of the same words and phrases cannot be avoided; so very few are the variations in expression, and so frequent the necessity of repeating them, that it is hoped the good natured reader will forgive them.

The situation of the main having in the last chapter been fixed upon, and also every other part of the work marked out, the workmen are called upon to begin, which the master workman does, by measuring the distance from the center, where

the head of the main B. is to be drawn to the fence ditch twenty six feet; and at the tail, or lower end of it at D, from the centre twenty two feet: returning to the head of the main again, he measures off, from the stick in the centre, six feet, on each side of it; that is east, and west, placing his lines thirty yards long each; one on each side, and at the lower end of the line he sets off from the centre there five feet nine inches; thus the main will at the head be twelve feet wide, and at the distance of thirty yards will be six inches narrower. Then with his spade (when he has no marking instrument on purpose) standing on the west side of the west line, with his face to the east, he marks the edge of the main, by cutting through the sward on the out side of that line. He does the same on the other side, by standing on the east side of the east line, with his face to the west; he marks that side of the main likewise, on the out, or east, side of the line. He then removes the line, another length downwards, abating six inches in the width as before; he in the same manner marks that length, on both sides; and so continues till he gets to the lower end of the main to D, abating three inches of a side, each length of line he measures. Returning to the head of the main again, he begins to shake off the sward with his

water

water meadow spade, which performs it in a manner so even, and exact, that when each spit is turned upon the edge of the main, they join so nearly together, that it looks like a solid line of earth, the green sward being turned downwards.

The laborers then dig out the soil, and throw it out, some on one side, some on the other, but the greatest part on the lowest, or east side, to strengthen and raise that side of the main high enough to force the water over the way pane.

What materials are wanted more than the main produceth, are taken from that part of the way pane, which is nearest the fence ditch; that the water may have the more descent over it.

The depth of the main is proportioned to the depth of the stream, and the quantity of materials wanted. The reason the sights, or sticks, are set up in the centre of the main, and the decrease in the width made equally on each side of them, is to make the main appear straight; for if the decrease were to be made all on one side of the centre, it would have a sad effect when viewed from either end: the mould or foil that is thrown out of the main, and spread regularly, forms an easy descent from the edges or banks of the main on both sides. When all the green clods are not wanted for the sides or banks of the main

main at one place, they are reserved to be in readiness, if wanted, at another ; for, from the inequality of the ground, at one part one spit may be enough to raise the banks, at another two, three, or more may be wanted ; the principal workman then levels all the inequalities he may find and the main is finished. The trenches shall be the next part examined ; and they being already set out at their proper distances. (See the last Chapter). The workman fixes one end of the line on the bank of the trench, a foot from the centre stick, the other end three inches less ; he then marks out the edge with his spade, on the outside of the line ; then changes the line to the other side and repeats the same, abating three inches every length, 'till he comes to the end of the trench, which is generally, within from twelve to sixteen feet of the tail drain. The lower end of the trench should be about ten inches wide. The workman next forms the trench, beginning at the lower end, by standing on the part that is to be the trench, with his face to the tail drain, and dividing the sward into narrow spits, he takes it up neatly with his spade about four inches thick, and lays it exactly on the edge of the trench, with the earth side upwards. Each spit follows the other as it is dug up, and fits exactly ; the sides are pared down even,

and

and the bottom very smooth ; where ever a bend is supposed (for there is no knowing exactly 'till the water is let into the trench) to be wanted, he leaves a narrow strip of the green sward whole across the trench, and goes on as before, backing up the sides of the bend as well as the other part. The workman then goes to the tail drain, and marks it out with the line, beginning at the end next the main, but leaving from twelve to eighteen feet between the head of the trench and the main. At the upper end it should be about ten or twelve inches wide, and continue increasing three inches of a side, each length of the line till it is carried into the tail drain. The labourers are then set to dig it out, beginning at the lower end, throwing half the soil on each side to be conveyed to the trenches, to back them up, and give them a proper descent towards the trench drain all the length, and also the low end towards the tail drain. They then chop the clods to pieces, tread them down, and level the ground very even. The drains should be taken up as deep as conveniently can be done ; two ends will be answered by it, gaining an additional quantity of materials, and the more effectually and speedily draining the ground, when the water is not upon it.

Trenches

Trenches and drains in their form are the reverse of each other ; the one widest at the top, the other at the bottom ; the one not carried down quite to the lower end, the other not brought up to the higher. The reason is plain, for their uses are also opposite, the one to bring the water upon the ground, the quantity continually decreasing as it runs down, the other to carry it off, which is constantly increasing as it goes off into the tail drain. The mouths of the trenches are scarce any deeper than the other part, so that when the main is not full, no water will run into them ; consequently the meadow is not sodden, or poached by it, when there is not enough to water it ; but if the trenches were dug deeper, the water would stand in them, and make the panes sodden. No certain rules can be laid down for the width of the trenches and drains ; it varies from several causes, the descent of the ground, the breadth of the panes, and the length of the trenches ; and also from the firmness or porosity of the soils, for the firmer the land is, the wider the panes may be made, but in loose boggy soils the very reverse ; consequently the breadth of the trenches must likewise vary. The trench drains must be drawn in proportion to the trenches ; from hence it follows,

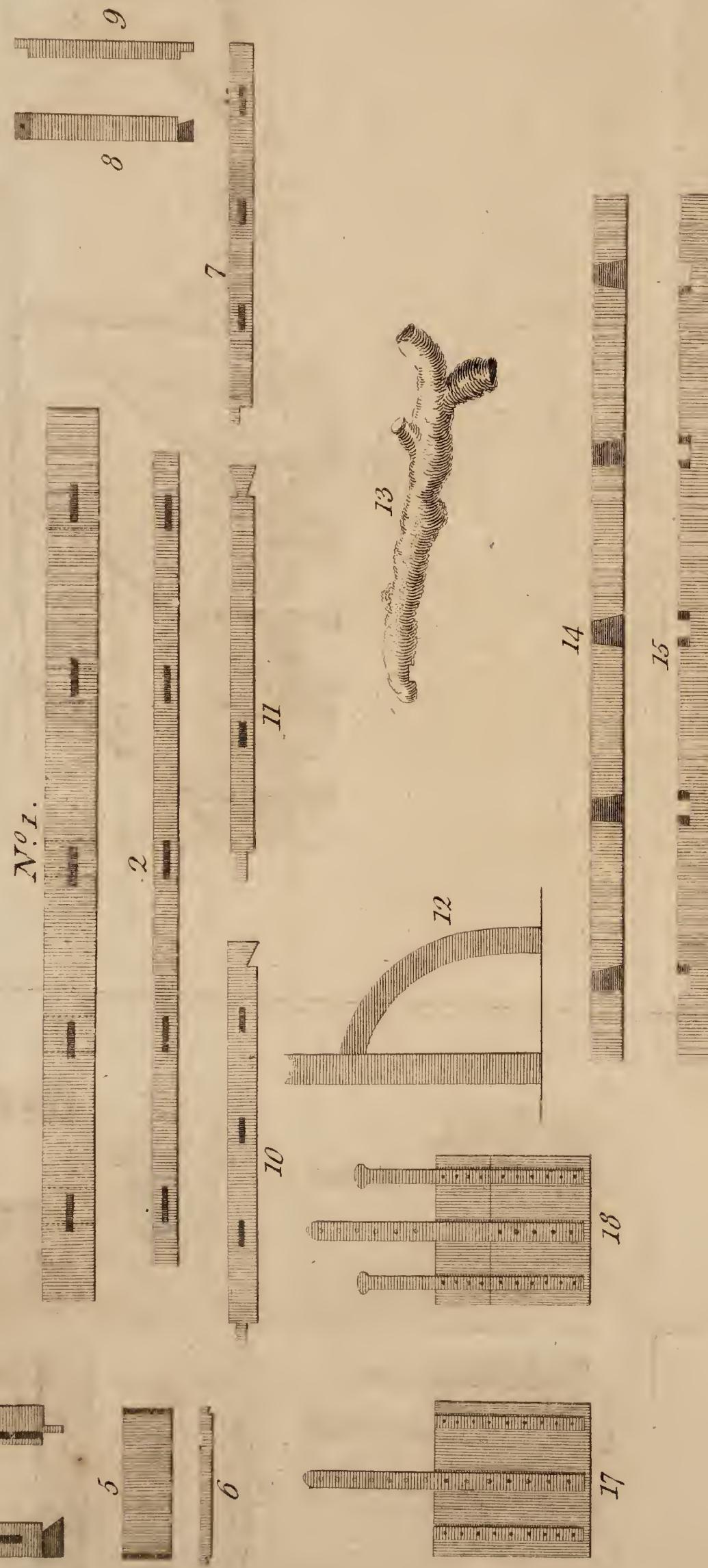
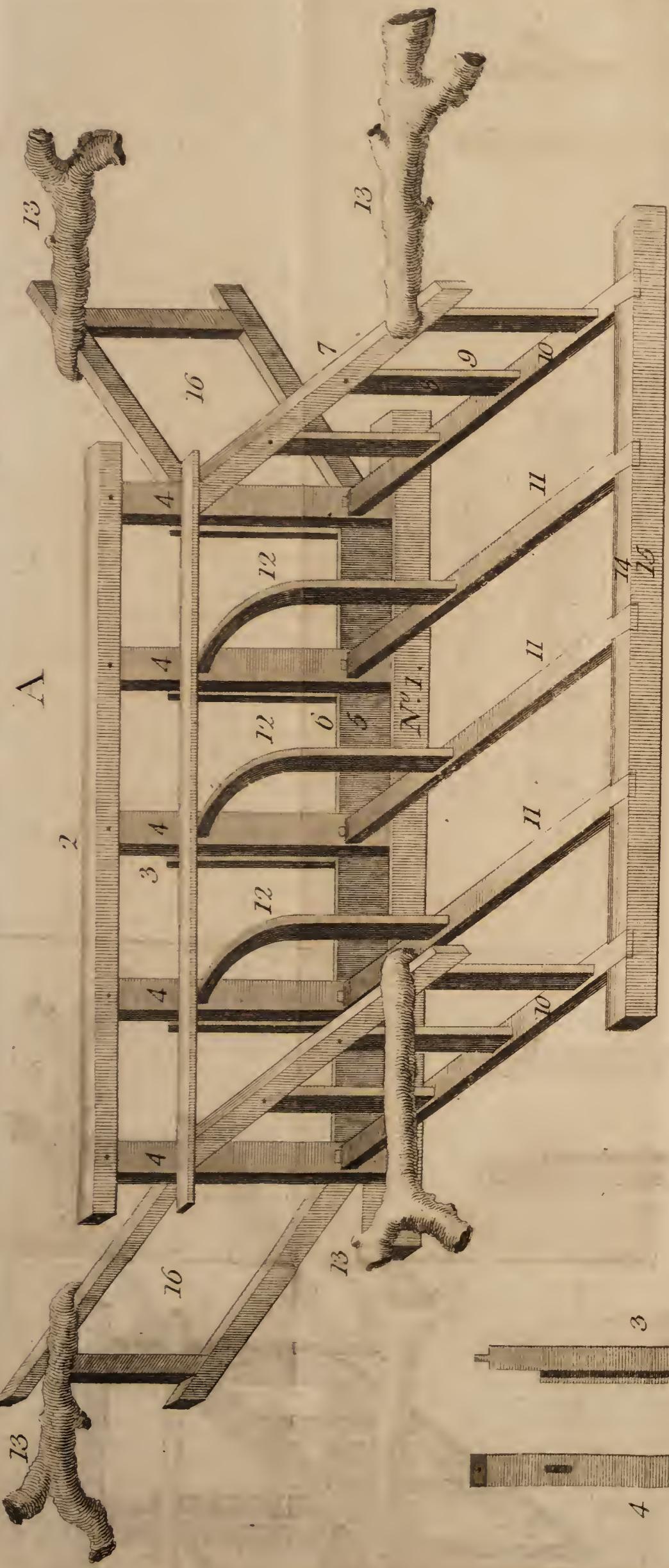
“ that the more superficies the water has

" to spread, the greater the quantity of water must be, and that must have a wider space to run in." The trench M comes next to be drawn; it is marked out by the workman the same as the others were, only wider, as far as the first angle; it there makes a sharp turn, and is drawn strait to the next angle in the same manner, and then turns again, and is carried to within the same distance of the tail drain as the others. The green sward is taken off, and laid on each edge of the trench, beginning at the lowest, as the former were done; the branch trenches are then marked out, and taken up in the same manner, only being very short; they are made much narrower, but the sides are backed up by the materials from the trench drains as before directed. The principal drain K next follows to be drawn, and as it receives many trench drains into it, as well as the water from the panes on each side of it, quite through, it is necessary to have it of a considerable breadth, and as deep as the tail drain will admit of. The materials, if not all wanted for the trenches, should be carried into the flats. Thus are all the trench drains formed, and when laid out regularly have a very pleasing effect, when viewed from a distance. It may be thought by persons who have never seen any water meadows, that great part

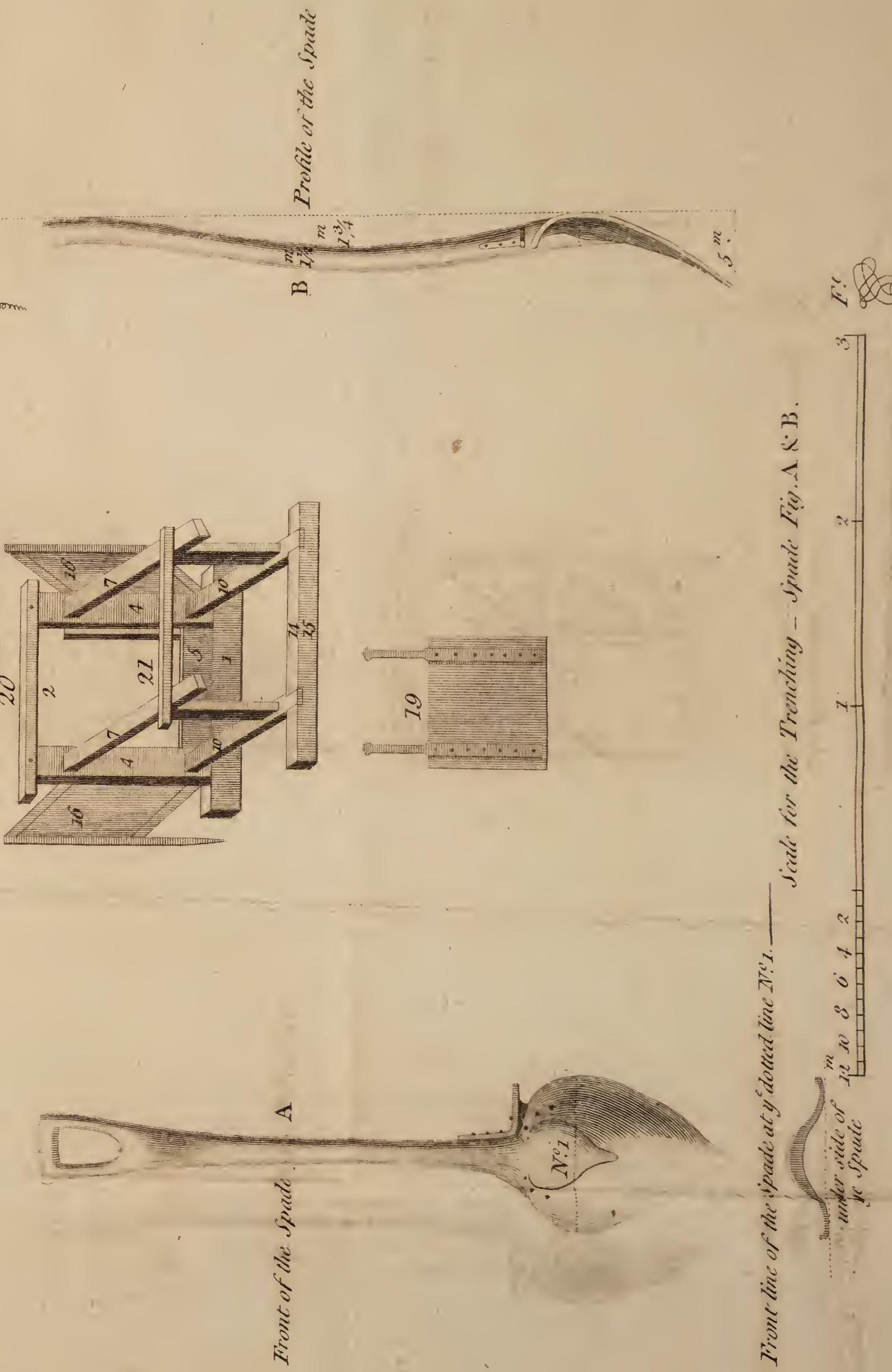
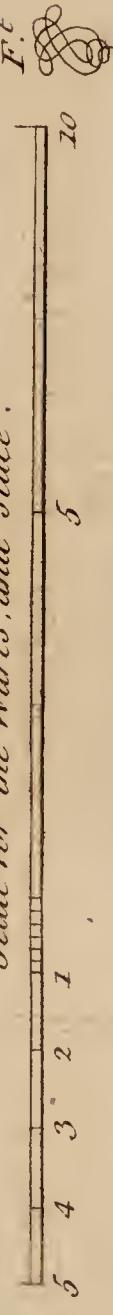
of the precaution here recommended and enforced, is unnecessary ; but they are much mistaken ; water, when divided, and subdivided into such small partitions is very easily obstructed; and requires great care and exactness in the execution of the works. Bends are the next parts of the work to be done. This is performed by taking two, or more, green clods, and placing them opposite each other on the sides of the trench where the bend is found necessary to be made, and are pressed and trod so near together, till the water flow over the edges above them ; gutters are the last part of the work ; if short, the workman does it by his eye. First marking out one side with the spade, very much aslant from him, then the other side in the same manner, and the part between them is taken out ; the spade meeting in a point at the bottom. If long, they are drawn by the line. These gutters are taken from the ends of the trenches, and carried towards the longest corner of the panes, or from the sides of the trenches upon any of the rising ground in the panes over which the water would not flow, if it were not in this manner conveyed upon it. One general observation may here be made; though equally applicable to every part ; that the master's eye is exceedingly necessary to examine every part as minutely as possible,



Plan 5<sup>th</sup>.



Scale for the Wares and Slices:



Front line of the Spade at dotted line N° I. — Scale for the Trenching - Spade Fig. A & B.



possible, taking care that the trenches are cut even, and the bottoms smooth, and level; that the sides of the drains are cut perpendicular, and the bottoms shovelled out clean, and that the clods and soil taken out of the trenches and drains be laid close and compact to the sides of the trenches; that they are well trodden together, and laid with a regular descent, getting the most possible fall from the trench to the drain; for "the swifter the water runs over the pane the better." All new work should be done early in the summer, and the banks, &c. as soon as finished, sown with the seeds of the hay loft, that there may be a sward upon the ground at watering time, otherwise the water will wash the loose earth in channels.

## C H A P. IX.

*Description of a Ware, and its different Parts.*

PLAN. V. *A View of a Ware, with a Section of its various Parts, and also of a Sluice.*

A. THE perspective of a ware, with its bed.

No. I. The head fill, the staples, or uprights No. 4. 4. 4. tenanted into it, dovè-tailed on the one side, and wedged in on the other, as is shewn in the Section, No. I.

2. The head-piece to receive the upper parts of the staples, No. 4.
3. The staple edge way, with the groove, to receive the hatch.
4. The back or lower side of the staple next the land, mortised to receive the sleeper and land rail, or land side, above the three uprights or puncheons, No. 8, 9.
5. The flight, rising from the head fill, No. 1, to the under part of the hatch, in the grooves of the staples, upon the fill.
6. The edge of the flight, shoul-dered back, and fixed into the grooves of the staples.
7. The land rail, or land side, mortised to be fixed upon the puncheons, No. 8, 9.
8. The broadest part of the puncheon, dove-tailed, to fix into the sleeper, No. 10.
9. The edge way of the puncheon, shouldered towards the ware bed.
10. A sleeper next the land, tenanted into the staple, and dove-tailed into the fill.
11. A middle sleeper, mortised to receive the shore or support to the staple, halfed down and dove-tailed into the tail fill.
12. The shore cut compassing, tenanted into the staple and sleeper.
13. A rough piece of timber called a land tye, or land brace, to confine the side framings in their proper places, one end is jawed

jawed unto the land rail, or land side, the other buried deep into the ground. It is used also for the same purpose, and in the same manner to the fore wing.

N. B. If it is only a two, or three hatch ware, or a sluice, instead of these land tyes, a tail spread is used as at No. 21, in the sluice, No. 20.

14. The upper side of the tail fill to dove-tail the sleepers into.

15. The lower edge of the tail fill.

16. The wings against the bank, mortised into the front of the staples.

17. A hatch ledged, and a middle stem with holes to draw the hatch out of the ware with a lever, which is necessary when they are deep, and a considerable weight of water against them.

18. Another hatch parted into two, within about eighteen inches or two feet of the top; the upper part is made to draw with two handles. These hatches are of peculiar use in large wares, both for the convenience of drawing them, as well as to regulate the water by, by means of these top hatches, a part of the water may be let off over the other sufficient to water some meadow below, whilst the principal stream, by the under hatches, is diverted another way. These are called flood hatches.

19. Another hatch adapted to the sluice.

20. A sluice compleat, the fore part or wings

wings piled, and boarded from the staples to the piles.

21. The tail spread to the sluice or ware.

22. The bridge which bears on the land sides, or rails over the puncheons, and is also supported by brackets from the shores, No. 12.

N. B. If the bed of the ware is stone instead of plank, it must be fixed down to the sleepers, with double-headed cranks like a T, or single-headed ones like an inverted L, thus T.

The framing against the land on each side of the ware may be either secured with stone or plank, on the ground side of the puncheons.

The sides next the land should be filled with clean gravel a foot and half or two feet thick, well rammed and piled at the tail of the ware. Clean gravel also put under the bed, and round the fills, and even with the top of the flight.

If the ground should be rotten, a bed two or three feet wide is requisite, before the head-fill framed into it, in all respects the same as that behind it, and is called the fore pannel.

## C H A P. X.

*The various Erections in Water Meadowes,  
Wares of Timber or Bricks.—Directions  
for erecting them.—Sluices.—Manner of  
building them.—Trunks, how put in.—  
Drain Sluice.—Setting it in.—Observa-  
tions and Remarks.*

**I**N erecting (or setting, as it is mostly called) any wares, sluices, trunks, &c. the first thing is to make a firm breast-work, to prevent the water coming into the work. To set a ware cross a river it is thus done. In plan the fourth above the ware I, several piles are drove into the river, at some distance from each other, and on the upper, or west side of them, several planks, or strong poles, are fixed cross the stream, (having before diverted the water as much as possible, by opening all the wares above that, to convey the water some other way) a quantity of green clods are procured, and laid in above those rails, taking care to spread them a yard wide at the bottom, and tread them very close and hard; thus keep raising, and treading it, decreasing the breadth of the breast-work, till it is made high enough to keep back the water. This mound of clods and earth will keep out the water, and resist the

the force better than any other materials for a short time. Make another below the ware I. I. across the stream ; this need not be so strong, nor high, as the other, its use being to keep the back water from coming into the holes, when dug out for the wares. The labourers are then set to work to dig out the place where the ware I. I. is to be set, generally two feet under the bottom of the river ; for the head fill is at least a foot thick, and let down a foot under the bed of the river. A quantity of gravel is to be procured, the cleanest that can be had. The hole for the ware should be two feet at least larger than the ware, which is to be filled with gravel, well rammed close and hard. This ware being made of timber, (in plan the fifth is a particular description of each part) is always framed, and every part fitted, and marked, and put together, by the carpenter, before it is brought to the meadow ; nothing else being necessary here, but to set the head and tail fill at their proper depths, and exactly level ; the staples perpendicular, and then to key the tenons together, and nail down the boards for the bed, &c. sides, &c. Particular care must be taken that the gravel is well rammed round the fills under the bed, and by the sides, as far as the timber extends ; without this precaution the labour is all lost, for the timber can only

protect it, from being washed away ; it is the gravel that prevents the leaking, and bursting out of the water.

The ware I is built with bricks and timber. The foundation is first dug out as the other, only rather larger ; for if there should be a considerable head of water, the walls must be proportionately thick ; the head fill, staples, and head piece, and tail fill are timber ; the land sides, fore, and tail wings, and bed are bricks ; the bed is laid with bricks an edge with mortar. The mortar is such as is used for mill work, and is called terris ; it hardens and even swells in the water, but common mortar is washed out by it. The walls are made from eighteen inches to two feet and half thick. This ware must likewise be well gravelled, otherwise it will not resist the water.

Sluices are set in the same manner, only not having such weight of water to resist, the timber, or brick work, need not be so thick, but like the other must be well gravelled, and rammed. Trunks are set in, by digging a place for them, so deep, that the upper part of the trunk is just level with the bed of the trench behind it ; if the ground be miry and rotten, a deep (but it need not be a very thick) fill must be let down before it, and a foot on each side longer than the trunk, upon which the mouth

of the trench should rest, the gravel well rammed under the trunk; a pile on each side, before and behind, is driven down close to the trunk, and a piece of timber crosses the top of it, from pile to pile, and another crosses the top of the lower part. These pieces secure the trunk in its place, and prevent the gravel, and earth, clods, &c. from falling over either into the mouth, or tail. The bottom and sides must be well gravelled, and beat close; the top may be covered with the materials, that come out, mixed with some gravel and the clods: it is to be observed these trunks lie under ground, and nine inches square is generally large enough, sometimes a foot is not too much. The drain sluice Z, vide Plan 4, is sometimes made like a sluice, and sometimes like a trunk, the latter is the least expence, and, unless some particular reason to the contrary, is to be preferred. A foot square is generally large enough, it is set exactly like any other trunk, only deeper, for the upper part of the trunk should be nearly level with the bed of the main. The drain into which it is to discharge the leaking water must be drawn deep enough to carry off the water into the tail drain. This trunk, like the others, must be well gravelled, and fixed by piles, and pieces, &c. the reason for setting it so deep, is that great part of the water that is in the main below,

below, may, when the drain trunk is opened, be drawn back to this low part, and so carried off; the tricklings of the leaking water will soon deepen a channel in the main to it.

In erecting wares, &c. particular care should be taken, that all the materials be firm, sound, and good; that the workmen execute every joint and part close and compact; that the gravel be the best that can be procured, and where that is very scarce, chalk may be mixed with it. Clay must be avoided, it is worse than the common soil. Great care must be observed, (if it is in quite new work); before the wares or sluices are framed, that the places, where they are to be erected, be well examined, to know what soil there is at the bottom; for a real, or artificial one, that is firm, must be gained; the former is to be preferred. Though the staples, &c. of the wares are obliged to be much the longer for it. If the latter, some extraneous bodies must be laid under to set the wares, &c. upon; every precaution must be taken, to guard against the waters finding a passage, or vent, under the bed of the ware. That will prove fatal to the whole work. Leakages by the sides, by digging them out, and well beating, and ramming fresh gravel in again, may be stopped. The same observation may be extended to all

the other works, and the same method of prevention should be taken.

In all wares and sluices, it is endeavoured to set their beds under the bed of the river, the fore fill lower than the hinder fill, and the tail of the ware made considerably wider, than the head, or where the staples stand, the fore wings spreading as much as possible before the head, and the hinder wings behind the tail. This is all done to resist the force of the water, and to prevent its becoming injurious. The fore wings by being spread open, it is imagined break the force of the water, and direct it into the thoroughs; where, by the spreading of the sides of the bed, and the tail, or hinder wings, the force is again weakened, as it finds immediately a larger space to occupy. The reason, for directing the head and tail fills to be set so deep, and the bed of the ware something under the bed of the river is, that the water meeting with no obstruction, as it passes through the ware, will not be so liable to wash under it, as it would, if it were set otherwise. The head of the ware should always be a little lower than the tail.

The sides of the wares should be no higher than the banks, and the head piece not more than nine inches above them. A plank for a bridge is laid across the ware, just behind the staples, both to pass over, and

and to stand upon, to draw up, or let down the hatches. The sides of a brick ware should be covered with tough green clods, which will resist the frost better than the bricks; and as they grow, they will keep them firm in their places. The dimensions of the different parts of a ware are so various, according to the breadth and depth of the river, that no certain rules can be laid down for them; two feet is wide enough for a thorough, even then, if it be a deep stream, and heavy body of water, it will require a small lever to draw it up with: descriptions of them have already been given. (see Plan 5.)

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## C H A P. II.

*Land Floods. Advantages to be made of them.  
The Manner of doing it. Reasons for recommending their Use.*

**T**O make this little Essay as useful as possible, the Editor thought it would not be unacceptable, to either the gentleman, or farmer, who may be unacquainted with this branch of husbandry, to be informed, how land floods may be successfully applied, to the purpose of watering meadows. They will always be found of great use, where the sweepings of towns,

farm

farm yards, &c. are carried down by them, seldom any other erection is wanting, beside a sluice or small ware to divert and convey them over the lands; if the situation of the land happens to be on the side of a hill, catch-drains are often absolutely necessary for watering the lower part of the hill, after the water has been used upon the upper; the manner of making them has been already described in many parts of the kingdom, where there are large hills, or extensive rising lands, great quantities of water run from them, into the vallies, after very heavy or continued rains, these might, with proper attention, be collected together, before they get to the bottom, or flat ground; and from thence be diverted, to the purpose of watering those lands, that lie below, with great advantage to the occupier, and at a small expence. And should the land thus situated be arable, yet it would be found a beneficial exchange, to convert it into water meadow, particularly, if pasture ground should be a desirable object to the occupier. This is just hinted to those farmers, who may happen to have lands thus situated; for although water cannot be had regularly, and constantly, yet, unless in exceeding dry seasons, rain falls so often, that many acres of land may, with proper attention, be frequently refreshed, and in rainy seasons well

well watered by it. The method of performing it, is thus recommended. Observe the piece of land, or field best adapted to the purpose, both for situation, and soil. If it should be arable, make it first very level, and with the crop of corn sow all sorts of hay seeds ; and as soon as it has gotten a green sward, it may be laid out. In the lowest part of the ground, draw a deep ditch for the current to run in, through it ; and continue it into some ditch, or low part in the lands below, that the water may be carried freely off, after it has been, and whilst it is, in use. Draw ditches, above the field intended to be watered ; aslant the sides of the hill, in such manner that they may all empty themselves into the head of the ditch above mentioned ; just where it enters the field to be watered. Then erecting a ware across this ditch, the field will be capable of being watered, like Plan the first, or Plan the second, just as the ditch happens to be situated ; either by being in the middle or on one side. It must then be conveyed, by small mains or trenches, and subdivided again by branch trenches, according to the scite of the field, and the quantity of water that can be collected ; trench drains must be drawn, and the water conveyed into the ditch by means of tail drains, as those Plans direct. A person unacquainted with

water

water meadows, cannot conceive the advantage arising from water thus collected, and conveyed, over this species of water meadow ; (if it may properly be called by that name) being generally a firm, good soil ; for the water running down, from rich, cultivated hills, eminences, &c. sweeps away with it, when the rain falls very heavy, vast quantities of dung, dropt by sheep, and other cattle, and the manure carried upon the arable lands, which being thus diverted over the intended meadow, with an easy descent, gives time for the particles of manure to subside upon the ground at one season, or of being filtered through the young grass as it dribbles through it, at another ; the warm weather afterwards pushes on the vegetation amazingly. Meadows thus situated would, be vastly superior to any other ; if they had the advantage of a constant stream ; but valuable even as they are, taking the opportunity of watering them, by every heavy rain or flood that happens. The occupier of such lands is strenuously advised, to let no time be lost, in appropriating them to this use ; because these lands are healthy, for all kind of cattle, at almost all seasons. And the expences of converting them, into this kind of water meadow, are exceeding small, the annual charges afterwards quite trifling, and the produce very considerable.

C H A P.

## C H A P. XII.

*Repairing the Works. Banks trod down by the Cattle. Trenches and Drains, by the Teams carrying out the Hay-repaired. Leakages at the Wares, Sluices, &c. stopped: Tail-drains cleansed. Materials disposed of. Trenches and Drains renewed. Directions for doing it. Caution with Remarks.*

To make this “attempt” as useful and instructive as possible, the method of repairing the works, previous to the general watering, was thought of too much importance to pass unnoticed. After the cattle have eaten the after-math bare, it will be found very necessary for the workman to examine, first, the mains, if there are any weak places in the banks. By the treading of the cattle, whether any quantities of mud, sand, &c. are gathered in the angles, the one must be strengthened and repaired, and the other thrown out. The trenches, drains, &c. will, if the land is pretty firm, by repairing, do their offices three years; otherwise not more than two; but every season they will want some repairing. That is done, by going regularly over every trench, taking out whatever is found in them; the treadings of the cattle,

N.

&amp;c.

&c. horses, breaches made by wheels, &c. are to be replaced, and trod down neat and even. The drains are next to be looked to; all obstructions to be removed, and replaced, if necessary, or conveyed into the flats. The wares, sluices, trunks, &c. must be examined; hatches, if broke, or lost, amended, or replaced; sides of the wares, &c. if any vents for the water, by the vermin, &c. must be stopped again; should the leakage be near the bottom, the sides must be dug down 'till the bottom of the leak can be found, and well rammed, otherwise it will not be prevented. It has been observed, that the works, with this kind of repairing, may last three years without being renewed. The workmen take care to divide their work, so as to have a part to execute every year: if a main has a quantity of sedge, reed, rushes, &c. grown in it, they are first mown off, and where the men can stand in it, the roots, mud, &c. are thrown out, and the bottom shovelled clean, otherwise pulled out with the long crooks. The long withered parts brought home to the farm yards, the other spread about and chopped small where wanted. The tail drains must be cleansed in the same manner. Here it may be noted, that the mud, roots, &c. taken out of the tail drain, and every other drain, must be carried away clean, into those flats or weak places.

places in the mains, &c. where necessary, but never left upon the sides. The tail drains require cleansing oftner than the mains; because the water carries all the extraneous bodies of the panes, &c. into them; if they meet with any obstruction there they gather together, and strike the water back into the other drains. The manner of renewing, or taking up a trench is thus done. The workman with his spade, first marks down the edges of the trench, beginning at the head, on one side, and then on the other, exactly the same, as directed for new work; only now he can do it without a line: this is done that the edges may be straight, and the spits come out freely; he then begins at the lower end of the trench, standing the opposite way, that is, with his face fronting the head, or upper part of the trench, and takes the spits out of it, by thrusting the spade from him, the same, as if he was shovelling; He, by this means is enabled to make the bottom of the trench very smooth, and to take the mud, grass, &c. out, in very thin spits: the materials he places neatly on the edge of the trench, as he takes them up, and beats the sides even with the spade at the same time; thus he finishes the trench as he goes along; any extra materials are thrown by, and afterwards put where wanted. A particular caution should be

attended to, not to suffer the workman to make the edges of the trenches and drains, any wider in repairing, than they were, when made new. This they are very apt to do; any extra width in the trenches offends the eye, and is loss of green ground, consequently loss of hay, &c. at the seasons. Guard also against their throwing the materials, which they thus take out of the trenches, behind the edge of the trench in a ridge; this also widens the trench, and promotes weeds. Take particular care, that it is laid neat and level, and even, with it.

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### C H A P. XIII.

*Watering the Meadows.—Disposing of the Water in the Meadows.—Work to be done when it is there.—When, and how often it should be changed.—Spring feeding it.—Floods.—Sanding or Mudding to be prevented.—Rude Waters, Opinions upon them.—Stock feeding the after-share.—Cautions about it.—Observations and Remarks.*

THE works being all properly prepared for receiving the water, and the grass eaten and bare, begin by shutting close the ware I. I. in Plan 4. opening

ing ware I, observing to water the parts of the meadow best adapted to the quantity of water ; if a strong water, all the high ground, if but a little water, the low ground ; if a flood, all of it. Supposing now, from heavy rains (which in October are frequent) there is water enough for the whole : the water will soon fill the main, and flow into the trenches ; when they are full, the workman, with a short narrow scythe, mows the edges of the mains, trenches, and drains on both sides ; the water carries the dead grass, &c. as it is mown, down to the bends, and ends of the trenches ; there, with a fork, it must be taken out, and put in small cocks, to be carried away by the carts the first opportunity : this must be done to every trench in the meadow regularly : then go up and down the main, observe, if the water is risen to the height wanted ; any places in the bank that may be too low, must be raised with small spits of green clods. Those which are afterwards found too high, take little gutters out of, or pare them down : when the length of the main is not very great, certainly pare off those parts. Thus make the banks of the mains as level as possible, the water just dribbling over them, as it goes along. Examine every trench in the same manner ; placing bends where necessary. Filling up the old gutters, if not wanted,

wanted, and cutting, where useful, new ones. This is frequently done, for the weight of the water will compress the boggy, corky parts of the soil, and it will subside in some places, more than others : even bends are sometimes necessary to be removed ; very often to be either widened or pressed closer together, and not seldom to be new made ; for the water will wash deep gullies at the bends. And where the descent is very great, sticks and pieces of boards are used to check the water at the bends. Thus will the water be conveyed regularly and evenly, over every part of the meadow, the hatches to the trunks, and various wares, either taken quite out, or fixed, to the proper height, to let enough, and not too much, water into every trench, &c. for, as has been before observed, the art of watering consists in giving every part of the meadow its due quantity of water equally alike ; the subdividing it into different turns has been already described ; the method of watering, and management of the water in each turn, is exactly the same, therefore need not again be repeated : it may be just remarked here ; that, when the water is low, keep it together, rather using it, to water only two or three trenches properly, and well, than letting it run down to the tails of many, which rots the ground there, and does no good at any other part.

Every

Every two or three days the workman should go and examine the trenches, removing every obstruction, and strengthening all weak places. The various drains must be examined. If the water should fill them and rise over upon the edges, and they cannot be made deeper, they must be widened. Very great floods must not be taken as a guide in this instance, but a regular strong water. At this season the water may be kept upon the ground a month, or even six weeks safely, if it be a corky or boggy soil, or a strong clay, but not quite so long on a sand or gravelly soil. When it is turned out of one part, it may be put into another, in the same manner, and so on to a third part; it may then be taken back again upon the part first watered. Now a fortnight, or three weeks, is long enough for the water to remain upon the ground. Thus it may be continued shifting from place to place; taking care to examine the mains, trenches, &c. each time the water is brought into them, repairing the breaches, strengthening the weak places, and removing all kinds of obstructions. When the days grow longer, and begin to be warmer, it must not be suffered to remain so long; that is, after Candlemas, a fortnight is full long enough, and the next turn a week. This will bring it to about the beginning of March, by which

which time there will be, if the weather is tolerably mild, grass long enough to take the ewes and lambs, or fatting sheep, to finish them for the butcher; the benefit to either is very great, but to the former it is inestimable; at this season to have a full bite of fine young grass for the ewes, and so encrease their milk for the lambs, when otherwise they would have scarce any thing but dry hay to live upon, every farmer is left to judge the advantage of. Upon this grass they may be permitted to feed till the beginning of May, changing them into the different meadows. As soon as they are taken out, the water must be turned in for a week, carefully examining every trench, and drain, for the reas ons above given; then shifted into others, alternately watering and draining, lessening the time the water remains upon it, as the weather grows warmer; and in five, six, or seven weeks, the grass will be fit to be mown for hay; and produce from one to two tons, or even more an acre on good ground. About a week before the grass is to be mown, let the water into it for about twenty-four hours, it will make the ground moist at the bottom; the scythe will go through it the easier, and it will be mown the closer for it; but care must be taken to let it only just dribble through the

the grass. If rain should fall, there will be no occasion to let the water in, and it is otherwise a matter of choice rather than necessity, it ought not to be done in rotten meads. The feeding the meadows about Lady-day is called Spring feeding, and should never be done by any other cattle, besides sheep or calves. The weight of others poach the land, tread in the trenches, &c. destroying more grass with their feet than their mouths. From Michaelmas to Candlemas great attention should be given to all floods that may happen, whether from heavy rains, or the melting of the snow, ice, &c. never to let any pass unregarded; but all the wares, sluices, &c. should be opened, and, as much as possible, of the land flooded with it; these waters are always very thick and rich, being the washing of all the country. A few days therefore of such water is invaluable. It ought here to be remarked, that if there is any quantity of grass in the meadows not eaten, these flood-waters must be kept out, otherwise the grass will be spoiled, for they bring with them such quantities of sand and mud, which will stick to, and lodge amongst the grass, and cattle of all kinds have such an aversion to any gritty substance, that they will starve rather than eat it. When the floods come down early in the fall, large quantities of egrass or aftermath are spoiled by it, in the flat countries. The same atten-

tion must be had, to great floods late in the spring, or rather the beginning of the summer, occasioned often by heavy rains. They must be kept out of the meadows then, if possible, by shutting all the wares at the heads of the mains, &c. and leaving the passage of the river quite free, and the drain sluices opened ; for, as was before observed, these floods bring with them a quantity of slime, and mud, and sand, which by the rapidity of the current is spread through all the trenches, and so over the panes where it subsides. This in the winter, when the lands are bare, is quickly washed into the soil, and becomes an excellent manure, by the rains frequently falling upon it ; but in the beginning of summer, when the grass is grown pretty long and often lies down, the slime and sand that is brought by the floods, stick to the blades of grass, and there seldom are rains enough to wash it off ; besides at this season, the sun very soon absorbs the watery particles, that assist in forming the slime and mud, &c. and leaves the oily substance, to which the sand adheres, upon the blades ; neither will the cutting, making, stacking, &c. shake it off sufficiently for the cattle to eat it. When it thus happens to be flooded, sometimes after it is cut, it is thrown by slovenly farmers into the river ; sometimes on the arable land, as manure to rot, and others make it into hay, and in the early part

part of the winter give it freely to cattle, which, at that season, pick out a little of the best, the refuse serving to bed the farm yard.

Neither if left uncut, will the cattle eat it; besides that would spoil the after grass. One certain rule is, “make use of the floods, when the grass can’t be used; “ avoid them when the grass is long and “soon to be fed or cut.” It has often been a subject of dispute, “whether from the latter end of autumn to Candlemas, the throwing a very strong body of water, “where it can be done, over the meadows, “is of any essential service, or not.” Those who consider it as advantageous, assert, that, when the waters run rude, and strong over the ground, it beats down, and rots the tufts of foggy, or rough grass, sedge, &c. that are always to be found in many parts of coarse meadow ground; therefore is of peculiar service to them. On the other side it is alledged, that by coming in so large a body, it beats the ground, in the weak places, particularly so bare, that the sward is destroyed, and also brings with it such quantities of seeds of weeds, that at the next hay season the land, in all those bare places, bears a large burden of weeds, but little grass.

The general opinion of the watermen upon this point is, that, in water meadows, which are upon a warm sandy, or gravelly soil, with no great depth of loam upon them; rude, strong watering, even

in winter, always does harm, without any possible essential service. On the contrary, strong cold clay land will bear a great deal of water, a long time without injury; and boggy, cork, or spungy soil, will also admit of a very large and strong body of water upon it (provided the drains are made wide and deep enough to carry it off without forcing back upon the ends of the panes) with great advantage for almost any length of time at that season. The weight and force of the water vastly assists in compressing those soils, which only want solidity and tenacity to make them produce great burdens of hay; nothing in their opinion corrects, and improves those soils so much, as a very strong body of water, kept a considerable time upon them, at that season: the reader is here made acquainted with the reasons given for the using of rude strong waters in the early part of the winter. The Editor owns, that he still has doubts upon the subject, nor can he by any means acquiesce in this opinion, unless by rude strong waters, he is permitted to understand only a rather larger quantity of water conveyed over the land at this early season, than ought to be used in the spring, or summer; unmanageable waters he believes always hurtful.

It may be proper just to add, that as soon as the hay is carried off the meadows, cattle of any sort (except sheep) should be put into them, to eat the grass out of the

the trenches, and what may be left by the mowers. This, perhaps, will last them a week ; then the water may be put into the meadows in the manner as has been already described, taking care to mow the long grass, which obstructs the water in the trenches, and this mowing is best done, when the water is in them. Let the weeds, leaves, &c. be taken out and put in heaps to be carried away into the farm yards ; examine the trenches, make up the breaches, &c. take particular care, that the water only dribbles over every part of the panes as thin as possible, this being the warmest season of the year. The first watering should not be suffered to last longer than two or three days, before it is shifted off, (and if it is a wet season, perhaps not so long, as warmth seems to be the greatest requisite, after the land is once wet, to assist vegetation) to another part, or meadow beat out by the cattle, by this time fit to take it. Do by this meadow exactly the same, and so by a third and fourth, if so many meadows belong to the occupier. Observe at all times, when the water is taken out of a meadow, to draw up the drain sluice hatches, without doing that, watering is an injury : by the time three, or four parts, are thus regularly watered, the first will be found to have an eddish, aftergrass, or aftermath, with such a rich and beautiful verdure as will be astonishing ; and both the quantity, and quality,

will

will be beyond conception, compared with the state the lands were in, before they were watered.

Aftermath, aftergrass, foggy, or eddish, as differently called in different countries, is of vast advantage to milch beasts. The butter made from it is excellent.

This will explain the reason, why every person should if possible have three or four meadows, that can be watered: for here, whilst the cattle are eating the first, the second is growing, the third draining, &c. and the fourth under water. In this manner the aftermath will in a mild season last the cattle 'till Christmas. A reason was given why the spring grass should be fed only by sheep or calves, it may be necessary to tell why the aftermath ought not to be fed by them, because it will infallibly rot them. No sheep, except those which are just fat, must ever be suffered, even for an hour, in water meadows, except in the spring of the year; and even then care must be taken, that every part of the meadows have been well watered; and that they are not kept in them longer, than the beginning of May. Although at present it is unknown, what is the occasion of the rot, yet certain it is, that even half an hour's feeding in an unhealthy ground has often proved fatal. They after a short time begin to lose flesh, grow weaker, and weaker; the best feeding in the kingdom cannot improve them, after they once fall away,

away, and when they die, or are killed, small animalcula, like plaise, are found in the livers. Other symptoms also they are known by. Scarcely any ever recover from a slight attack, but when farther advanced it is always fatal. Guard, by all means, against keeping the water too long upon the meadow in warm weather. It will very soon produce a white substance like cream, which is prejudicial to the grass, and shews it has been upon the ground too long already ; but if permitted to remain a little longer, a thick scum will settle upon the grass of the consistence of glue, and as tough as leather, which will quite destroy it, where ever it is suffered to be produced. The same bad effects seem to arise from rude waters, neither can the scum easily be got off.

Rolling meadows, in the spring of the year, is an excellent method. It should be done after Candlemas, when, the meadow has been laid dry a week. It should be always rolled length-ways of the panes, up one side of the trench, and down the other. Rolling also contributes much to the grass being cut close to the surface when mown, which is no small advantage ; for the little hillocks, spewings of worms, anthills, &c. are by this means pressed close to the ground, which would otherwise obstruct the scythe, and take off its edge, and to avoid that inconvenience the workmen always mow over them.

## C H A P. XIV.

## H A Y - M A K I N G .

THE grass is ripe when it is in full blossom, and it should then be cut. A person that can be trusted should follow the mowers, really to ted the swaths, that is, scatter it all over the ground, and not to barely turn it over, which is too often the method practised, especially where it is made by the acre, as is the custom in some places, immediately after the scythe. Thus it may remain all the day. As soon as the dew is off, the next day, it must be turned again and again, and before night put into little grass pooks, or cocks ; the trenches and drains raked clean out ; the next morning it is again tedded, and raked nearer together ; for, as it withers, it occupies less space, turned afterwards over and over in the day, and long before night put into whales (rows) afterwards into large cocks, and the ground raked around them ; the next day those cocks are again spread, turned, and if not dry enough, put still into larger cocks. The following day opened, turned, and carried to the stacks. Let it be here hinted, that as the mowers keep on cutting the grass every day, all the parts of hay-making are going forward at the same time. Therefore men, women and children must be employed, in proportion to the quantity of ground, too many hands are seldom to be

be had. Round stacks are the best, unless the quantity of hay is great; then they must be made as it may be most convenient. Much has been said and written, “whether hay is best carried together green enough to heat in the stack, and when taken out should be of a foxy colour, or dried enough to come out, the colour it went into the stack? To support the latter opinion, the London hay is quoted as the best in England, so it is, and so is the herbage, and so is the land artificially made. The difference in the quality, as well as the species of the herbage, should be considered. The water meadow hay is made of a long stalky grass, full of joints, when good, which retains the juices some time in them; if this grass be kept turning till these knots are properly dried to prevent its heating, the other part would scarce be better than old dead rusty grass, and would have no smell in it; but when carried, as soon as the leaves are well withered, it heats in the stack, and when cut out of it, is mostly of a pale dingy red. It smells well. Cattle eat it greedily, and it does them double the good it would otherwise.

#### C O N C L U S I O N.

T H E Reader has at length been brought through all the various processes in the system of watering meadows from the first rude state, of coarse, wet, boggy

boggy ground, to the final improvement, into sound, firm, good water meadow: Every particular part has been described with a scrupulous minuteness. The subject teems with advantages to very many parts of the kingdom. The Editor is conscious that he has not designedly protracted his instructions for any other purpose, than to assist the industrious farmer, who, attentive to the improvement of his lands, dares to engage in a system entirely new to him. Such a person, whatever may be the opinion of others, will not, he believes, think he has been too tedious in his directions. If it should be found he has failed in perspicuity in some instances, been too prolix, or made needless repetitions in others, let it be considered, that it is an "attempt" only; and then he trusts, that the good-natured Reader will forgive him; especially as he has executed it to the best of his abilities, and wished to give every imaginable satisfaction he was capable of.

Plain matters of fact, warranted by his own experience, are related in plain farmers language, and where thought rather obscure, are here attempted to be explained. If it shall be found, that he has tolerably succeeded, he shall be content; or if he provokes an abler pen, to give his country a better system, he shall think his time and labour have been well employed.

F I N I S.



